TABLES
OF
COMPLEX HYPERBOLIC AND CIRCULAR FUNCTIONS

KENNELLY

E. R. Hedrick

To my esteemed colleague
Professor Hedrick

26th April 1923
4 pm G. M. C. T.
108 Pierce Hall
Harvard

TABLES

OF

COMPLEX HYPERBOLIC AND CIRCULAR FUNCTIONS

BY

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PREFACE

The tables in this book present hyperbolic and circular functions of a complex variable, both in polar and rectangular coördinates. Such complex functions have not hitherto been published, except over a very restricted range. They have important applications in electrical engineering. For instance, it is possible with their help to find in a few minutes the potential, current and power, at any point of an alternating-current line-conductor of known constants and terminal conditions; whereas the same problem, to a like degree of precision, without aid from these functions, and by older methods, would probably occupy hours of labor and cover several sheets of computing-paper.

Although the principal application of these functions at the present time is in dealing with alternating-current lines, especially those of either great length or high frequency; yet it seems likely that other uses will develop for them.

The author desires to acknowledge his indebtedness, for suggestions and help, to a number of workers, both in mathematical and practical fields; and particularly to Messrs. C. L. Bouton, W. Duddell, E. V. Huntington, F. B. Jewett, John Perry, H. J. Ryan, and E. B. Wilson.

A. E. K.

Harvard University
January, 1914.

PREFACE TO THE SECOND EDITION

In preparing the second edition of this book, six new tables have been computed. These are actually extensions of the tables I to VI already incorporated. It has been considered advisable to add the new material in new tables at the end of the volume rather than to recast the original tables in such a manner as to include the new matter. The new matter has been found necessary in certain departments of electrical engineering to which complex hyperbolic functions may be advantageously applied.

A. E. K.

Harvard University
June, 1920.

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TABLES OF COMPLEX HYPERBOLIC AND CIRCULAR FUNCTIONS

TABLE I. HYPERBOLIC SINES. $\sinh (\rho \underline{/\delta}) = r \underline{/\gamma}$

°	0.1	°	0.2	°	0.3	°	0.4	°	0.5	°
45	0.10000	45.096	0.20000	45.383	0.30001	45.860	0.40005	46.532	0.50016	47.391
46	0.099993	46.095	0.19995	46.382	0.29985	46.858	0.39968	47.529	0.49944	48.388
47	0.099987	47.095	0.19990	47.381	0.29969	47.856	0.39931	48.526	0.49872	49.385
48	0.099981	48.094	0.19986	48.380	0.29954	48.854	0.39893	49.520	0.49799	50.378
49	0.099975	49.094	0.19982	49.378	0.29939	49.852	0.39856	50.513	0.49727	51.368
50	0.099970	50.094	0.19976	50.376	0.29923	50.848	0.39820	51.506	0.49656	52.357
51	0.099965	51.093	0.19972	51.374	0.29907	51.842	0.39784	52.497	0.49585	53.342
52	0.099960	52.092	0.19968	52.371	0.29892	52.834	0.39748	53.486	0.49514	54.325
53	0.099955	53.091	0.19963	53.367	0.29877	53.826	0.39712	54.472	0.49444	55.304
54	0.099950	54.090	0.19959	54.362	0.29862	54.818	0.39676	55.458	0.49374	56.281
55	0.099944	55.089	0.19955	55.357	0.29847	55.809	0.39641	56.440	0.49305	57.254
56	0.099939	56.088	0.19951	56.352	0.29833	56.799	0.39607	57.421	0.49238	58.226
57	0.099933	57.086	0.19946	57.347	0.29819	57.787	0.39572	58.400	0.49172	59.195
58	0.099928	58.085	0.19941	58.342	0.29804	58.773	0.39538	59.378	0.49106	60.160
59	0.099922	59.083	0.19937	59.336	0.29790	59.760	0.39505	60.354	0.49041	61.123
60	0.099917	60.082	0.19934	60.331	0.29777	60.746	0.39473	61.330	0.48978	62.085
61	0.099912	61.081	0.19929	61.324	0.29764	61.731	0.39441	62.302	0.48916	63.042
62	0.099907	62.079	0.19925	62.317	0.29751	62.715	0.39409	63.273	0.48855	63.998
63	0.099902	63.077	0.19921	63.309	0.29738	63.698	0.39379	64.243	0.48795	64.950
64	0.099897	64.075	0.19918	64.301	0.29725	64.680	0.39349	65.212	0.48738	65.900
65	0.099893	65.073	0.19914	65.293	0.29712	65.661	0.39320	66.179	0.48681	66.848
66	0.099889	66.071	0.19911	66.284	0.29700	66.641	0.39293	67.144	0.48627	67.794
67	0.099885	67.069	0.19908	67.275	0.29689	67.621	0.39266	68.108	0.48575	68.738
68	0.099881	68.066	0.19904	68.265	0.29678	68.599	0.39240	69.070	0.48523	69.679
69	0.099877	69.064	0.19901	69.255	0.29667	69.577	0.39214	70.030	0.48473	70.617
70	0.099873	70.062	0.19898	70.245	0.29657	70.555	0.39190	70.990	0.48426	71.554
71	0.099869	71.059	0.19895	71.235	0.29647	71.532	0.39167	71.948	0.48380	72.489
72	0.099865	72.057	0.19892	72.225	0.29637	72.508	0.39145	72.905	0.48338	73.422
73	0.099861	73.054	0.19889	73.214	0.29628	73.483	0.39123	73.861	0.48296	74.354
74	0.099858	74.051	0.19887	74.203	0.29620	74.458	0.39104	74.817	0.48257	75.284
75	0.099855	75.048	0.19885	75.192	0.29612	75.432	0.39084	75.771	0.48220	76.212
76	0.099852	76.045	0.19883	76.180	0.29604	76.406	0.39066	76.724	0.48184	77.138
77	0.099850	77.042	0.19881	77.168	0.29596	77.379	0.39050	77.676	0.48152	78.062
78	0.099847	78.039	0.19878	78.156	0.29590	78.351	0.39034	78.628	0.48121	78.986
79	0.099845	79.036	0.19876	79.144	0.28584	79.322	0.39018	79.578	0.48093	79.909
80	0.099843	80.033	0.19875	80.131	0.29578	80.294	0.39004	80.528	0.48067	80.830
81	0.099841	81.030	0.19873	81.118	0.29573	81.266	0.38993	81.477	0.48044	81.750
82	0.099839	82.026	0.19872	82.106	0.29569	82.238	0.38983	82.425	0.48023	82.669
83	0.099838	83.023	0.19871	83.093	0.29566	83.209	0.38973	83.373	0.48004	83.587
84	0.099837	84.020	0.19870	84.080	0.29563	84.180	0.38965	84.321	0.47987	84.505
85	0.099836	85.017	0.19869	85.067	0.29561	85.150	0.38958	85.268	0.47972	85.422
86	0.099835	86.014	0.19868	86.054	0.29559	86.120	0.38952	86.215	0.47960	86.338
87	0.099834	87.011	0.19868	87.041	0.29557	87.090	0.38948	87.162	0.47952	87.254
88	0.099833	88.008	0.19867	88.028	0.29555	88.060	0.38946	88.108	0.47947	88.170
89	0.099832	89.004	0.19867	89.014	0.29553	89.030	0.38944	89.054	0.47945	89.085
90	0.099831	90.000	0.19867	90.000	0.29552	90.000	0.38942	90.000	0.47943	90.000

Note. $\sinh (0 \underline{/\delta}) = 0 \underline{/\delta}$.

Examples. $\sinh (0.3 \underline{/65^\circ}) = 0.29712 \underline{/65^\circ.661} = 0.29712 \underline{/65^\circ.39'.40''}$.
$\sinh^{-1} (0.39018 \underline{/79^\circ.578}) = 0.4 \underline{/79^\circ}$.

	0.6		0.7		0.8		0.9		1.0	
°		°		°		°		°		°
45	0.60042	48.440	0.70094	49.676	0.80184	51.108	0.90327	52.728	1.00553	54.531
46	0.59918	49.437	0.69894	50.679	0.79885	52.112	0.89904	53.735	0.99975	55.540
47	0.59793	50.434	0.69695	51.676	0.79587	53.109	0.89482	54.734	0.99394	56.550
48	0.59667	51.426	0.69497	52.666	0.79291	54.099	0.89060	55.725	0.98816	57.543
49	0.59542	52.414	0.69299	53.652	0.78996	55.082	0.88640	56.707	0.98242	58.525
50	0.59418	53.398	0.69102	54.632	0.78703	56.058	0.88224	57.679	0.97672	59.495
51	0.59295	54.379	0.68907	55.606	0.78412	57.026	0.87810	58.642	0.97105	60.453
52	0.59174	55.355	0.68713	56.574	0.78124	57.987	0.87400	59.595	0.96543	61.399
53	0.59053	56.326	0.68521	57.537	0.77838	58.940	0.86993	60.538	0.95986	62.333
54	0.58932	57.293	0.68331	58.493	0.77555	59.886	0.86590	61.472	0.95435	63.255
55	0.58814	58.256	0.68144	59.445	0.77275	60.824	0.86192	62.396	0.94890	64.166
56	0.58698	59.215	0.67959	60.391	0.76999	61.755	0.85800	63.312	0.94353	65.065
57	0.58583	60.171	0.67776	61.331	0.76727	62.678	0.85414	64.218	0.93825	65.952
58	0.58469	61.122	0.67595	62.265	0.76459	63.593	0.85034	65.114	0.93305	66.827
59	0.58357	62.069	0.67419	63.193	0.76195	64.502	0.84660.	66.000	0.92795	67.691
60	0.58249	63.013	0.67247	64.117	0.75938	65.405	0.84295	66.878	0.92295	68.544
61	0.58142	63.953	0.67078	65.036	0.75686	66.300	0.83937	67.747	0.91805	69.385
62	0.58037	64.889	0.66912	65.951	0.75439	67.189	0.83587	68.607	0.91325	70.215
63	0.57934	65.821	0.66749	66.859	0.75197	68.070	0.83244	69.458	0.90856	71.033
64	0.57834	66.749	0.66591	67.762	0.74962	68.944	0.82909	70.300	0.90400	71.841
65	0.57737	67.674	0.66437	68.661	0.74733	69.812	0.82585	71.136	0.89957	72.637
66	0.57643	68.596	0.66288	69.554	0.74512	70.674	0.82270	71.962	0.89527	73.424
67	0.57553	69.515	0.66145	70.444	0.74298	71.529	0.81967	72.780	0.89111	74.201
68	0.57465	70.430	0.66005	71.329	0.74091	72.379	0.81672	73.590	0.88708	74.968
69	0.57379	71.342	0.65870	72.209	0.73891	73.223	0.81387	74.392	0.88320	75.723
70	0.57297	72.251	0.65740	73.085	0.73698	74.061	0.81114	75.187	0.87947	76.469
71	0.57219	73.157	0.65616	73.957	0.73513	74.894	0.80853	75.975	0.87589	77.207
72	0.57145	74.061	0.65498	74.825	0.73337	75.722	0.80602	76.756	0.87247	77.936
73	0.57074	74.962	0.65385	75.689	0.73169	76.544	0.80363	77.530	0.86921	78.656
74	0.57006	75.860	0.65278	76.550	0.73009	77.361	0.80137	78.298	0.86612	79.368
75	0.56941	76.756	0.65176	77.408	0.72858	78.174	0.79924	79.059	0.86320	80.072
76	0.56881	77.649	0.65081	78.263	0.72716	78.982	0.79723	79.815	0.86045	80.769
77	0.56824	78.540	0.64992	79.114	0.72583	79.787	0.79535	80.566	0.85788	81.458
78	0.56772	79.429	0.64909	79.962	0.72459	80.588	0.79359	81.312	0.85549	82.141
79	0.56724	80.317	0.64832	80.808	0.72345	81.385	0.79197	82.053	0.85328	82.818
80	0.56679	81.203	0.64761	81.652	0.72241	82.179	0.79048	82.789	0.85125	83.489
81	0.56638	82.087	0.64697	82.493	0.72146	82.969	0.78913	83.522	0.84940	84.156
82	0.56602	82.970	0.64640	83.332	0.72061	83.757	0.78792	84.251	0.84774	84.817
83	0.56570	83.852	0.64589	84.169	0.71985	84.543	0.78685	84.976	0.84628	85.474
84	0.56542	84.732	0.64545	85.005	0.71919	85.327	0.78592	85.699	0.84501	86.128
85	0.56518	85.612	0.64507	85.839	0.71863	86.109	0.78513	86.420	0.84393	86.779
86	0.56498	86.490	0.64476	86.673	0.71817	86.889	0.78448	87.138	0.74305	87.426
87	0.56483	87.368	0.64452	87.506	0.71781	87.668	0.78397	87.855	0.84236	88.071
88	0.56473	88.246	0.64435	88.338	0.71755	88.446	0.78361	88.571	0.84186	88.715
89	0.56466	89.123	0.64425	89.169	0.71740	89.223	0.78339	89.286	0.84156	89.358
90	0.56464	90.000	0.64422	90.000	0.71736	90.000	0.78333	90.000	0.84147	90.000

Examples. sinh (1.0 /90°) = 0.84147 /90°.
sinh^{-1} (0.87947 /76°.469) = 1.0 /70°.

	1.1		1.2		1.3		1.4		1.5	
°		°		°		°		°		°
45	1.1089	56.519	1.2138	58.692	1.3205	61.034	1.4297	63.568	1.5418	66.262
46	1.1012	57.543	1.2037	59.726	1.3078	62.092	1.4138	64.639	1.5222	67.355
47	1.0935	58.555	1.1937	60.748	1.2951	63.128	1.3979	65.689	1.5027	68.426
48	1.0858	59.553	1.1838	61.753	1.2824	64.142	1.3822	66.717	1.4834	69.474
49	1.0782	60.536	1.1739	62.741	1.2699	65.137	1.3665	67.723	1.4642	70.496
50	1.0706	61.506	1.1641	63.712	1.2574	66.113	1.3509	68.707	1.4451	71.492
51	1.0630	62.461	1.1543	64.666	1.2450	67.068	1.3355	69.668	1.4262	72.462
52	1.0556	63.401	1.1446	65.603	1.2327	68.004	1.3202	70.605	1.4075	73.405
53	1.0482	64.327	1.1350	66.523	1.2206	68.919	1.3051	71.519	1.3889	74.321
54	1.0409	65.239	1.1256	67.425	1.2086	69.814	1.2902	72.409	1.3706	75.210
55	1.0336	66.136	1.1162	68.310	1.1967	70.688	1.2754	73.275	1.3525	76.072
56	1.0265	67.019	1.1070	69.178	1.1850	71.542	1.2609	74.117	1.3347	76.907
57	1.0195	67.888	1.0979	70.028	1.1735	72.376	1.2466	74.936	1.3172	77.713
58	1.0126	68.742	1.0890	70.860	1.1622	73.188	1.2325	75.730	1.3000	78.491
59	1.0058	69.581	1.0802	71.675	1.1511	73.980	1.2187	76.500	1.2831	79.240
60	0.99920	70.406	1.0716	72.474	1.1403	74.752	1.2052	77.246	1.2665	79.964
61	0.99269	71.218	1.0632	73.255	1.1296	75.502	1.1919	77.967	1.2503	80.657
62	0.98633	72.016	1.0550	74.019	1.1192	76.232	1.1790	78.663	1.2345	81.321
63	0.98013	72.800	1.0470	74.767	1.1091	76.942	1.1664	79.335	1.2191	81.956
64	0.97409	73.570	1.0392	75.497	1.0992	77.632	1.1541	79.983	1.2040	82.562
65	0.96821	74.327	1.0316	76.211	1.0895	78.301	1.1421	80.607	1.1894	83.140
66	0.96251	75.071	1.0242	76.909	1.0802	78.950	1.1305	81.207	1.1752	83.690
67	0.95698	75.801	1.0171	77.590	1.0712	79.580	1.1193	81.783	1.1615	84.211
68	0.95165	76.519	1.0102	78.257	1.0625	80.191	1.1084	82.335	1.1482	84.704
69	0.94650	77.225	1.0035	78.907	1.0540	80.783	1.0979	82.865	1.1354	85.169
70	0.94156	77.918	0.99712	79.543	1.0459	81.357	1.0879	83.373	1.1231	85.607
71	0.93682	78.600	0.99099	80.164	1.0382	81.912	1.0783	83.858	1.1113	86.018
72	0.93229	79.271	0.98514	80.771	1.0308	82.450	1.0691	84.322	1.1000	86.402
73	0.92798	79.931	0.97957	81.365	1.0237	82.971	1.0603	84.765	1.0893	86.761
74	0.92388	80.580	0.97428	81.946	1.0170	83.476	1.0520	85.188	1.0791	87.096
75	0.92001	81.220	0.96927	82.514	1.0107	83.966	1.0441	85.591	1.0694	87.406
76	0.91637	81.850	0.96456	83.069	1.0047	84.440	1.0367	85.975	1.0603	87.693
77	0.91296	82.471	0.96015	83.614	0.99916	84.900	1.0298	86.342	1.0518	87.958
78	0.90978	83.084	0.95605	84.148	0.99397	85.346	1.0233	86.692	1.0439	88.201
79	0.90685	83.689	0.95226	84.672	0.98917	85.780	1.0173	87.026	1.0366	88.425
80	0.90416	84.286	0.94878	85.187	0.98477	86.202	1.0119	87.346	1.0299	88.630
81	0.90172	84.877	0.94562	85.693	0.98077	86.614	1.0069	87.651	1.0238	88.818
82	0.89953	85.462	0.94279	86.191	0.97715	87.016	1.0024	87.944	1.0183	88.991
83	0.89759	86.041	0.94029	86.683	0.97400	87.408	0.99845	88.227	1.0135	89.149
84	0.89590	86.616	0.93811	87.169	0.97124	87.793	0.99502	88.499	1.0093	89.294
85	0.89447	87.186	0.93626	87.649	0.96890	88.171	0.99210	88.762	1.0057	89.429
86	0.89330	87.753	0.93474	88.124	0.96698	88.544	0.98971	89.018	1.0027	89.554
87	0.89238	88.317	0.93356	88.596	0.96548	88.912	0.98785	89.269	1.0004	89.673
88	0.89173	88.879	0.93272	89.065	0.96441	89.277	0.98652	89.515	0.99880	89.785
89	0.89134	89.440	0.93221	89.533	0.96377	89.639	0.98572	89.758	0.99782	89.893
90	0.89121	90.000	0.93204	90.000	0.96356	90.000	0.98545	90.000	0.99749	90.000

Examples. $\sinh(1.1 \angle 45^\circ) = 1.1089 \angle 56^\circ.519 = 1.1089 \angle 56^\circ.31'.08''$.

$\sinh^{-1}(1.1084 \angle 82^\circ.335) = 1.4 \angle 68^\circ$.

	1.6		1.7		1.8		1.9		2.0	
°		°		°		°		°		°
45	1.6575	69.117	1.7776	72.133	1.9029	75.292	2.0343	78.590	2.1726	82.016
46	1.6338	70.241	1.7493	73.288	1.8693	76.486	1.9947	79.829	2.1266	83.304
47	1.6103	71.339	1.7210	74.418	1.8359	77.651	1.9554	81.037	2.0809	84.560
48	1.5868	72.409	1.6929	75.515	1.8027	78.784	1.9165	82.210	2.0356	85.778
49	1.5635	73.451	1.6651	76.582	1.7697	79.883	1.8779	83.346	1.9907	86.958
50	1.5404	74.465	1.6375	77.618	1.7370	80.946	1.8396	84.444	1.9462	88.098
51	1.5175	75.449	1.6102	78.620	1.7046	81.974	1.8016	85.503	1.9022	89.196
52	1.4949	76.402	1.5831	79.590	1.6726	82.966	1.7643	86.524	1.8588	90.253
53	1.4725	77.325	1.5563	80.527	1.6410	83.921	1.7273	87.505	1.8160	91.267
54	1.4504	78.218	1.5299	81.429	1.6098	84.839	1.6909	88.444	1.7737	92.236
55	1.4285	79.079	1.5039	82.296	1.5791	85.718	1.6550	89.342	1.7320	93.160
56	1.4070	79.910	1.4782	83.128	1.5488	86.558	1.6196	90.197	1.6911	94.039
57	1.3859	80.709	1.4530	83.924	1.5190	87.358	1.5848	91.008	1.6509	94.869
58	1.3651	81.475	1.4282	84.683	1.4898	88.116	1.5506	91.773	1.6114	95.650
59	1.3447	82.209	1.4039	85.406	1.4611	88.834	1.5171	92.493	1.5726	96.382
60	1.3247	82.910	1.3800	86.091	1.4330	89.510	1.4843	93.167	1.5347	97.062
61	1.3051	83.578	1.3567	86.738	1.4055	90.142	1.4523	93.792	1.4976	97.688
62	1.2860	84.212	1.3339	87.347	1.3787	90.730	1.4210	94.368	1.4614	98.261
63	1.2674	84.813	1.3117	87.917	1.3525	91.274	1.3904	94.893	1.4260	98.778
64	1.2492	85.380	1.2901	88.447	1.3270	91.774	1.3606	95.368	1.3915	99.238
65	1.2316	85.913	1.2690	88.938	1.3022	92.228	1.3316	95.792	1.3580	99.639
66	1.2145	86.413	1.2486	89.390	1.2781	92.636	1.3035	96.162	1.3255	99.980
67	1.1979	86.879	1.2288	89.802	1.2548	92.997	1.2762	96.478	1.2940	100.261
68	1.1819	87.311	1.2097	90.175	1.2322	93.312	1.2499	96.741	1.2635	100.479
69	1.1664	87.710	1.1913	90.508	1.2104	93.580	1.2244	96.949	1.2340	100.634
70	1.1516	88.076	1.1736	90.801	1.1895	93.802	1.1999	97.102	1.2056	100.725
71	1.1373	88.410	1.1566	91.055	1.1694	93.976	1.1764	97.199	1.1783	100.750
72	1.1237	88.712	1.1403	91.271	1.1502	94.104	1.1539	97.241	1.1521	100.709
73	1.1107	88.982	1.1248	91.448	1.1318	94.187	1.1324	97.227	1.1271	100.602
74	1.0984	89.221	1.1101	91.588	1.1144	94.224	1.1119	97.158	1.1033	100.428
75	1.0867	89.431	1.0961	91.692	1.0979	94.215	1.0925	97.034	1.0807	100.187
76	1.0757	89.613	1.0829	91.760	1.0823	94.162	1.0743	96.856	1.0594	99.880
77	1.0654	89.767	1.0706	91.794	1.0677	94.068	1.0571	96.625	1.0394	99.507
78	1.0558	89.894	1.0591	91.795	1.0541	93.933	1.0411	96.343	1.0207	99.070
79	1.0469	89.997	1.0485	91.765	1.0415	93.758	1.0262	96.012	1.0033	98.571
80	1.0388	90.076	1.0388	91.705	1.0299	93.545	1.0126	95.633	0.98729	98.011
81	1.0314	90.134	1.0299	91.618	1.0194	93.298	1.0002	95.209	0.97271	97.394
82	1.0248	90.171	1.0219	91.505	1.0099	93.019	0.98899	94.744	0.95958	96.722
83	1.0189	90.191	1.0149	91.370	1.0015	92.711	0.97907	94.240	0.94792	96.000
84	1.0138	90.194	1.0088	91.214	0.99422	92.374	0.97043	93.702	0.93775	95.233
85	1.0095	90.184	1.0036	91.039	0.98802	92.015	0.96309	93.133	0.92911	94.426
86	1.0060	90.161	0.99929	90.850	0.98293	91.636	0.95706	92.539	0.92201	93.584
87	1.0032	90.129	0.99596	90.649	0.97896	91.241	0.95236	91.923	0.91646	92.713
88	1.0012	90.090	0.99357	90.438	0.97612	90.834	0.94899	91.291	0.91248	91.821
89	1.0000	90.046	0.99214	90.220	0.97442	90.419	0.94697	90.648	0.91009	90.914
90	0.99957	90.000	0.99166	90.000	0.97385	90.000	0.94630	90.000	0.90930	90.000

Examples. sinh (1.6 /60°) = 1.3247 /82°.910 = 1.3247 /82°.54′.36″.
sinh⁻¹ (1.1999 /97°.102) = 1.9 /70°.

	2.1		2.2		2.3		2.4		2.5	
°		°		°		°		°		°
45	2.3190	85.558	2.4745	89.205	2.6404	92.946	2.8177	96.769	3.0079	100.661
46	2.2658	86.905	2.4135	90.613	2.5707	94.419	2.7386	98.312	2.9185	102.278
47	2.2131	88.213	2.3530	91.981	2.5017	95.851	2.6603	99.813	2.8301	103.852
48	2.1608	89.482	2.2936	93.307	2.4334	97.241	2.5829	101.271	2.7429	105.383
49	2.1090	90.711	2.2337	94.592	2.3659	98.588	2.5065	102.685	2.6568	106.869
50	2.0577	91.898	2.1750	95.834	2.2992	99.890	2.4311	104.053	2.5720	108.309
51	2.0071	93.042	2.1171	97.031	2.2334	101.146	2.3568	105.375	2.4885	109.701
52	1.9571	94.142	2.0600	98.181	2.1685	102.354	2.2836	106.648	2.4064	111.044
53	1.9078	95.197	2.0037	99.284	2.1046	103.514	2.2117	107.871	2.3257	112.337
54	1.8592	96.205	1.9483	100.338	2.0418	104.623	2.1410	109.042	2.2465	113.578
55	1.8114	97.165	1.8938	101.342	1.9801	105.680	2.0714	110.160	2.1687	114.765
56	1.7644	98.076	1.8402	102.294	1.9195	106.683	2.0032	111.223	2.0925	115.896
57	1.7182	98.935	1.7876	103.193	1.8600	107.629	1.9364	112.228	2.0178	116.970
58	1.6729	99.742	1.7360	104.035	1.8016	108.518	1.8709	113.174	1.9447	117.984
59	1.6284	100.494	1.6854	104.820	1.7445	109.347	1.8068	114.059	1.8733	118.936
60	1.5849	101.191	1.6359	105.546	1.6886	110.114	1.7441	114.880	1.8035	119.823
61	1.5424	101.830	1.5875	106.210	1.6340	110.816	1.6829	115.634	1.7353	120.642
62	1.5008	102.410	1.5402	106.811	1.5807	111.451	1.6232	116.319	1.6688	121.391
63	1.4603	102.929	1.4941	107.345	1.5287	112.016	1.5649	116.931	1.6040	122.067
64	1.4208	103.386	1.4492	107.811	1.4780	112.509	1.5081	117.467	1.5409	122.665
65	1.3824	103.777	1.4055	108.207	1.4286	112.926	1.4528	117.924	1.4794	123.182
66	1.3451	104.101	1.3630	108.529	1.3806	113.264	1.3991	118.297	1.4196	123.613
67	1.3089	104.357	1.3218	108.775	1.3341	113.519	1.3469	118.583	1.3616	123.954
68	1.2738	104.542	1.2819	108.943	1.2890	113.688	1.2963	118.777	1.3052	124.198
69	1.2399	104.655	1.2433	109.029	1.2453	113.767	1.2473	118.874	1.2506	124.341
70	1.2072	104.694	1.2060	109.030	1.2031	113.752	1.1999	118.868	1.1977	124.376
71	1.1758	104.656	1.1701	108.944	1.1624	113.638	1.1541	118.754	1.1466	124.296
72	1.1457	104.541	1.1356	108.769	1.1232	113.422	1.1099	118.526	1.0972	124.092
73	1.1168	104.348	1.1026	108.501	1.0857	113.100	1.0675	118.177	1.0497	123.755
74	1.0893	104.074	1.0711	108.138	1.0498	112.667	1.0268	117.701	1.0040	123.277
75	1.0632	103.719	1.0411	107.678	1.0155	112.118	0.98795	117.091	0.96019	122.648
76	1.0385	103.283	1.0126	107.119	0.98292	111.449	0.95090	116.341	0.91831	121.857
77	1.0153	102.766	0.98581	106.459	0.95214	110.659	0.91576	115.443	0.87843	120.891
78	0.99353	102.168	0.96065	105.699	0.92320	109.744	0.88261	114.390	0.84063	119.740
79	0.97332	101.491	0.93722	104.839	0.89615	108.701	0.85152	113.178	0.80503	118.392
80	0.95468	100.736	0.91557	103.879	0.87109	107.531	0.82256	111.803	0.77173	116.836
81	0.93765	99 907	0.89575	102.822	0.84808	106.233	0.79589	110.261	0.74083	115.063
82	0.92229	99.008	0 87784	101.671	0.82719	104.810	0.77158	108.550	0.71251	113.065
83	0.90862	98.043	0.86187	100.432	0.80853	103.267	0.74974	106.676	0.68692	110.841
84	0.89668	97.015	0.84789	99.111	0.79215	101.611	0.73051	104.643	0.66422	108.390
85	0.88652	95.933	0.83596	97.715	0.77813	99.851	0.71396	102.462	0.64461	105.723
86	0.87817	94.806	0.82613	96.254	0.76655	98.000	0.70026	100.147	0.62827	102.855
87	0.87164	93.639	0.81845	94.740	0.75747	96.071	0.68948	97.717	0.61536	99.811
88	0.86696	92.443	0.81293	93.183	0.75095	94.082	0.68171	95.197	0.60602	96.624
89	0.86414	91.226	0.80961	91.599	0.74702	92.051	0.67703	92.615	0.60036	93.338
90	0.86321	90.000	0.80850	90.000	0.74571	90.000	0.67546	90.000	0.59847	90.000

Examples. $\sinh(2.5 \underline{/75^\circ}) = 0.96019 \underline{/122^\circ.648} = 0.96019 \underline{/122^\circ.38'.53''}$.
$\sinh^{-1}(0.60036 \underline{/93^\circ.338}) = 2.5 \underline{/89^\circ}$.

Table I. HYPERBOLIC SINES. sinh $(\rho \underline{/\delta}) = r \underline{/\gamma}$. Continued

	2.6		2.7		2.8		2.9		3.0	
°		°		°		°		°		°
45	3.2121	104.613	3.4318	108.614	3.6685	112.653	3.9236	116.721	4.1986	120.814
46	3.1115	106.307	3.3191	110.386	3.5426	114.506	3.7832	118.658	4.0426	122.832
47	3.0123	107.957	3.2079	112.116	3.4186	116.317	3.6453	120.551	3.8895	124.808
48	2.9144	109.564	3.0985	113.801	3.2966	118.084	3.5098	122.400	3.7394	126.741
49	2.8179	111.126	2.9908	115.442	3.1767	119.806	3.3768	124.205	3.5923	128.630
50	2.7229	112.641	2.8849	117.037	3.0590	121.483	3.2465	125.965	3.4483	130.474
51	2.6295	114.109	2.7809	118.585	2.9436	123.113	3.1189	127.679	3.3076	132.272
52	2.5378	115.528	2.6789	120.084	2.8306	124.694	2.9941	129.345	3.1701	134.024
53	2.4478	116.897	2.5789	121.532	2.7200	126.226	2.8721	130.963	3.0359	135.729
54	2.3595	118.214	2.4809	122.929	2.6118	127.708	2.7529	132.532	2.9051	137.386
55	2.2729	119.476	2.3850	124.274	2.5060	129.138	2.6366	134.050	2.7777	138.994
56	2.1882	120.684	2.2913	125.563	2.4027	130.515	2.5232	135.517	2.6536	140.553
57	2.1053	121.834	2.1996	126.797	2.3019	131.837	2.4127	136.932	2.5330	142.062
58	2.0242	122.925	2.1101	127.973	2.2036	133.103	2.3051	138.293	2.4157	143.519
59	1.9450	123.954	2.0228	129.088	2.1077	134.311	2.2004	139.598	2.3018	144.924
60	1.8677	124.918	1.9377	130.140	2.0144	135.459	2.0986	140.847	2.1912	146.276
61	1.7923	125.816	1.8547	131.128	1.9236	136.544	1.9997	142.037	2.0839	147.574
62	1.7187	126.644	1.7739	132.047	1.8352	137.565	1.9036	143.167	1.9798	148.817
63	1.6470	127.399	1.6952	132.895	1.7493	138.519	1.8103	144.235	1.8789	150.004
64	1.5772	128.077	1.6187	133.669	1.6658	139.403	1.7198	145.239	1.7812	151.133
65	1.5094	128.674	1.5442	134.364	1.5847	140.214	1.6319	146.176	1.6865	152.204
66	1.4435	129.185	1.4719	134.978	1.5060	140.948	1.5467	147.044	1.5948	153.214
67	1.3794	129.606	1.4016	135.504	1.4295	141.599	1.4641	147.838	1.5061	154.161
68	1.3171	129.930	1.3334	135.935	1.3553	142.164	1.3840	148.555	1.4202	155.043
69	1.2568	130.151	1.2673	136.266	1.2833	142.634	1.3063	149.190	1.3370	155.858
70	1.1983	130.262	1.2031	136.489	1.2136	143.005	1.2310	149.738	1.2565	156.602
71	1.1417	130.254	1.1409	136.596	1.1460	143.267	1.1581	150.191	1.1785	157.271
72	1.0870	130.117	1.0807	136.576	1.0804	143.411	1.0874	150.541	1.1030	157.860
73	1.0341	129.841	1.0226	136.415	1.0169	143.424	1.0189	150.780	1.0298	158.363
74	0.98316	129.414	0.96631	136.101	0.95550	143.292	0.95251	150.894	0.95893	158.772
75	0.93420	128.822	0.91207	135.617	0.89606	142.996	0.88819	150.867	0.89022	159.077
76	0.88720	128.049	0.85985	134.943	0.83862	142.516	0.82587	150.680	0.82356	159.265
77	0.84227	127.079	0.80965	134.058	0.78319	141.827	0.76551	150.309	0.75887	159.319
78	0.79948	125.893	0.76157	132.935	0.72979	140.897	0.70706	149.721	0.69605	159.216
79	0.75891	124.471	0.71568	131.542	0.67847	139.686	0.65054	148.876	0.63503	158.925
80	0.72068	122.793	0.67215	129.847	0.62934	138.145	0.59597	147.721	0.57573	158.404
81	0.68499	120.837	0.63109	127.812	0.58252	136.217	0.54340	146.183	0.51809	157.592
82	0.65203	118.583	0.59275	125.396	0.53822	133.833	0.49294	144.169	0.46213	156.404
83	0.62196	116.016	0.55739	122.554	0.49674	130.908	0.44484	141.553	0.40789	154.709
84	0.59507	113.126	0.52536	119.252	0.45849	127.351	0.39946	138.168	0.35548	152.313
85	0.57164	109.910	0.49705	115.458	0.42399	123.066	0.35738	133.795	0.30521	148.903
86	0.55191	106.382	0.47291	111.164	0.39394	117.968	0.31946	128.168	0.25775	143.974
87	0.53621	102.571	0.45344	106.390	0.36915	112.015	0.28691	121.005	0.21433	136.701
88	0.52479	98.524	0.43912	101.194	0.35055	105.244	0.26143	112.110	0.17731	125.843
89	0.51783	94.307	0.43033	95.682	0.33893	97.809	0.24496	101.576	0.15092	110.091
90	0.51550	90.000	0.42738	90.000	0.33499	90.000	0.23925	90.000	0.14112	90.000

Examples. $\sinh(3.0 \underline{/50^\circ}) = 3.4483 \underline{/130^\circ.474} = 3.4483 \underline{/130^\circ.28'.26''}$.
$\sinh^{-1}(0.15092 \underline{/110^\circ.091}) = 3.0 \underline{/89^\circ}$.

TABLE II. HYPERBOLIC COSINES. cosh ($\rho \; \underline{/\delta}$) = $r \; \underline{/\gamma}$

δ °	0.1 r	0.1 γ °	0.2 r	0.2 γ °	0.3 r	0.3 γ °	0.4 r	0.4 γ °	0.5 r	0.5 γ °
45	1.00001	0.287	1.00013	1.148	1.00067	2.578	1.00210	4.578	1.00519	7.141
46	0.99983	0.287	0.99943	1.146	0.99910	2.577	0.99933	4.584	1.00085	7.159
47	0.99966	0.286	0.99873	1.144	0.99753	2.576	0.99655	4.584	0.99649	7.166
48	0.99948	0.285	0.99804	1.141	0.99597	2.571	0.99378	4.578	0.99214	7.165
49	0.99931	0.283	0.99735	1.136	0.99441	2.562	0.99101	4.566	0.98780	7.155
50	0.99914	0.282	0.99666	1.131	0.99285	2.551	0.98824	4.551	0.98347	7.137
51	0.99897	0.280	0.99597	1.123	0.99131	2.536	0.98547	4.528	0.97917	7.109
52	0.99880	0.278	0.99529	1.115	0.98977	2.519	0.98274	4.500	0.97490	7.073
53	0.99863	0.275	0.99462	1.105	0.98825	2.498	0.98003	4.467	0.97065	7.028
54	0.99846	0.272	0.99395	1.094	0.98674	2.474	0.97734	4.427	0.96644	6.973
55	0.99830	0.269	0.99329	1.081	0.98525	2.447	0.97468	4.382	0.96226	6.910
56	0.99814	0.265	0.99263	1.067	0.98377	2.417	0.97205	4.332	0.95814	6.838
57	0.99798	0.261	0.99199	1.052	0.98232	2.383	0.96945	4.276	0.95406	6.756
58	0.99782	0.257	0.99135	1.036	0.98089	2.347	0.96690	4.214	0.95005	6.666
59	0.99766	0.253	0.99073	1.018	0.97948	2.308	0.96438	4.147	0.94609	6.567
60	0.99751	0.249	0.99012	0.999	0.97810	2.267	0.96191	4.075	0.94219	6.460
61	0.99736	0.244	0.98952	0.979	0.97674	2.221	0.95948	3.998	0.93838	6.343
62	0.99721	0.238	0.98893	0.957	0.97541	2.173	0.95711	3.914	0.93465	6.217
63	0.99707	0.232	0.98835	0.934	0.97411	2.123	0.85478	3.826	0.93099	6.083
64	0.99693	0.226	0.98780	0.910	0.97285	2.070	0.95251	3.733	0.92741	5.941
65	0.99679	0.220	0.98725	0.885	0.97163	2.014	0.95031	3.635	0.92393	5.789
66	0.99666	0.214	0.98672	0.859	0.97044	1.955	0.94816	3.532	0.92054	5.631
67	0.99653	0.207	0.98621	0.832	0.96927	1.894	0.94608	3.423	0.91725	5.463
68	0.99641	0.200	0.98571	0.804	0.96814	1.830	0.94407	3.310	0.91407	5.288
69	0.99629	0.193	0.98523	0.775	0.96706	1.764	0.94213	3.193	0.91100	5.106
70	0.99617	0.185	0.98477	0.744	0.96601	1.696	0.94026	3.072	0.90805	4.916
71	0.99606	0.177	0.98433	0.713	0.96500	1.626	0.93846	2.946	0.90521	4.718
72	0.99596	0.169	0.98391	0.681	0.96404	1.553	0.93674	2.816	0.90248	4.513
73	0.99586	0.161	0.98350	0.648	0.96313	1.479	0.93510	2.682	0.89989	4.302
74	0.99576	0.153	0.98312	0.614	0.96227	1.402	0.93354	2.544	0.89742	4.085
75	0.99567	0.144	0.98276	0.580	0.96145	1.324	0.93207	2.403	0.89508	3.861
76	0.99559	0.135	0.98242	0.545	0.96068	1.244	0.93069	2.258	0.89288	3.631
77	0.99551	0.126	0.98210	0.509	0.95996	1.162	0.92938	2.111	0.89081	3.396
78	0.99544	0.117	0.98181	0.472	0.95929	1.078	0.92816	1.960	0.88889	3.155
79	0.99537	0.108	0.98154	0.435	0.95866	0.993	0.92705	1.807	0.88711	2.910
80	0.99531	0.099	0.98128	0.397	0.95808	0.908	0.92603	1.652	0.88548	2.660
81	0.99525	0.090	0.98105	0.359	0.95756	0.821	0.92509	1.494	0.88399	2.406
82	0.99520	0.080	0.98085	0.320	0.95710	0.732	0.92425	1.333	0.88266	2.149
83	0.99515	0.070	0.98067	0.281	0.95670	0.643	0.62351	1.170	0.88147	1.888
84	0.99511	0.060	0.98051	0.242	0.95635	0.552	0.92287	1.006	0.88044	1.624
85	0.99508	0.050	0.98037	0.203	0.95605	0.461	0.92233	0.841	0.87957	1.357
86	0.99506	0.040	0.98026	0.163	0.95580	0.369	0.92189	0.675	0.87886	1.087
87	0.99504	0.030	0.98018	0.123	0.95560	0.277	0.92154	0.508	0.87830	0.816
88	0.99502	0.020	0.98012	0.082	0.95545	0.185	0.92128	0.340	0.87790	0.544
89	0.99501	0.010	0.98009	0.041	0.95537	0.093	0.92112	0.171	0.87766	0.272
90	0.99500	0.000	0.98007	0.000	0.95534	0.000	0.92106	0.000	0.87758	0.000

Note. cosh ($0 \; \underline{/\delta}$) = $1.0 \; \underline{/0^\circ}$ for all values of δ.

Examples. cosh ($0.5 \; \underline{/81^\circ}$) = $0.88399 \; \underline{/2^\circ.406}$ = $0.88399 \; \underline{/2^\circ.24'.22''}$.

$\cosh^{-1}$ ($0.97810 \; \underline{/2^\circ.267}$) = $0.3 \; \underline{/60^\circ}$.

Table II. HYPERBOLIC COSINES. $\cosh (\rho \underline{/\delta}) = r \underline{/\gamma}$. Continued

	0.6		0.7		0.8		0.9		1.0	
°		°		°		°		°		°
45	1.01070	10.254	1.01982	13.890	1.03360	18.010	1.05333	22.567	1.08031	27.487
46	1.00449	10.291	1.01136	13.960	1.02263	18.132	1.03959	22.755	1.06358	27.762
47	0.99825	10.315	1.00289	14.013	1.01164	18.231	1.02583	22.919	1.04680	28.011
48	0.99199	10.327	0.99441	14.050	1.00063	18.309	1.01203	23.059	1.03000	28.235
49	0.98575	10.326	0.98594	14.071	0.98963	18.368	0.99822	23.176	1.01315	28.433
50	0.97953	10.313	0.97748	14.075	0.97864	18.405	0.98443	23.267	0.99632	28.603
51	0.97333	10.287	0.96906	14.061	0.96768	18.421	0.97064	23.332	0.97950	28.743
52	0.96716	10.248	0.96066	14.031	0.95675	18.414	0.95690	23.372	0.96270	28.854
53	0.96103	10.196	0.95232	13.982	0.94587	18.384	0.94320	23.383	0.94596	28.933
54	0.95495	10.131	0.94404	13.916	0.93506	18.332	0.92957	23.367	0.92928	28.981
55	0.94893	10.053	0.93582	13.831	0.92432	18.256	0.91603	23.321	0.91267	28.994
56	0.94296	9.961	0.92768	13.728	0.91367	18.156	0.90257	23.246	0.89615	28.974
57	0.93706	9.856	0.91962	13.606	0.90312	18.031	0.88922	23.140	0.87976	28.917
58	0.93125	9.738	0.91166	13.465	0.89270	17.881	0.87602	23.003	0.86350	28.823
59	0.92552	9.606	0.90382	13.306	0.88240	17.705	0.86294	22.833	0.84739	28.689
60	0.91987	9.461	0.89607	13.127	0.87222	17.505	0.85001	22.631	0.83142	28.518
61	0.91433	9.303	0.88846	12.929	0.86221	17.278	0.83727	22.394	0.81564	28.303
62	0.90889	9.131	0.88100	12.713	0.85237	17.024	0.82471	22.122	0.80008	28.047
63	0.90357	8.945	0.87369	12.476	0.84271	16.743	0.81237	21.814	0.78475	27.745
64	0.89838	8.747	0.86653	12.220	0.83324	16.435	0.80025	21.471	0.76966	27.396
65	0.89332	8.536	0.85954	11.945	0.82398	16.100	0.78837	21.091	0.75484	26.999
66	0.88838	8.312	0.85272	11.652	0.81494	15.738	0.77675	20.673	0.74029	26.555
67	0.88358	8.076	0.84609	11.339	0.80613	15.349	0.76540	20.218	0.72603	26.061
68	0.87894	7.827	0.83966	11.007	0.79757	14.931	0.75435	19.722	0.71212	25.513
69	0.87445	7.565	0.83344	10.656	0.78927	14.486	0.74362	19.188	0.69857	24.911
70	0.87012	7.292	0.82744	10.287	0.78125	14.014	0.73322	18.615	0.68539	24.254
71	0.86596	7.007	0.82166	9.900	0.77352	13.515	0.72317	18.001	0.67261	23.541
72	0.86197	6.711	0.81611	9.496	0.76610	12.990	0.71347	17.348	0.66026	22.772
73	0.85816	6.404	0.81081	9.075	0.75899	12.438	0.70416	16.656	0.64836	21.946
74	0.85454	6.086	0.80576	8.637	0.75220	11.860	0.69527	15.926	0.63692	21.061
75	0.85111	5.758	0.80097	8.183	0.74575	11.257	0.68681	15.156	0.62599	20.115
76	0.84787	5.420	0.79646	7.713	0.73965	10.630	0.67878	14.347	0.61560	19.111
77	0.84484	5.073	0.79222	7.228	0.73392	9.979	0.67121	13.502	0.60577	18.049
78	0.84201	4.718	0.78826	6.729	0.72856	9.306	0.66412	12.621	0.59652	16.929
79	0.83939	4.355	0.78459	6.217	0.72359	8.612	0.65753	11.706	0.58790	15.753
80	0.83698	3.984	0.78121	5.694	0.71901	7.897	0.65145	10.755	0.57991	14.521
81	0.83479	3.606	0.77814	5.159	0.71484	7.164	0.64589	9.776	0.57259	13.237
82	0.83282	3.221	0.77538	4.613	0.71108	6.413	0.64087	8.768	0.56596	11.904
83	0.83108	2.831	0.77293	4.057	0.70774	5.647	0.63641	7.733	0.56005	10.526
84	0.82957	2.436	0.77079	3.493	0.70483	4.867	0.63252	6.674	0.55487	9.105
85	0.82828	2.037	0.76898	2.922	0.70236	4.075	0.62921	5.595	0.55046	7.647
86	0.82722	1.634	0.76750	2.345	0.70033	3.272	0.62648	4.498	0.54683	6.157
87	0.82640	1.228	0.76634	1.763	0.69875	2.462	0.62435	3.386	0.54399	4.642
88	0.82581	0.820	0.76551	1.177	0.69761	1.645	0.62283	2.263	0.54195	3.106
89	0.82546	0.410	0.76501	0.589	0.69693	0.823	0.62192	1.133	0.54072	1.556
90	0.82534	0.000	0.76484	0.000	0.69671	0.000	0.62161	0.000	0.54030	0.000

Examples. $\cosh (0.7 \underline{/71^\circ}) = 0.82166 \underline{/9^\circ.900} = 0.82166 \underline{/9^\circ.54'.00''}$.
$\cosh^{-1} (0.69857 \underline{/24^\circ.911}) = 1.0 \underline{/69^\circ}$.

Table II. HYPERBOLIC COSINES. $\cosh(\rho \underline{/\delta}) = r \underline{/\gamma}$. Continued

	1.1		1.2		1.3		1.4		1.5	
°		°		°		°		°		°
45	1.1157	32.686	1.1608	38.076	1.2163	43.570	1.2830	49.084	1.3616	54.550
46	1.0959	33.067	1.1376	38.582	1.1897	44.210	1.2529	49.864	1.3279	55.471
47	1.0759	33.424	1.1143	39.063	1.1630	44.827	1.2227	50.625	1.2941	56.378
48	1.0559	33.754	1.0910	39.517	1.1363	45.421	1.1926	51.365	1.2604	57.266
49	1.0359	34.056	1.0676	39.943	1.1095	45.989	1.1624	52.083	1.2267	58.134
50	1.0158	34.328	1.0443	40.341	1.0828	46.529	1.1322	52.777	1.1931	58.982
51	0.99578	34.570	1.0209	40.709	1.0561	47.041	1.1021	53.446	1.1596	59.810
52	0.97577	34.780	0.99757	41.045	1.0294	47.525	1.0720	54.090	1.1262	60.618
53	0.95580	34.957	0.97428	41.349	1.0027	47.978	1.0421	54.708	1.0929	61.407
54	0.93589	35.100	0.95104	41.618	0.97613	48.400	1.0122	55.299	1.0598	62.175
55	0.91605	35.206	0.92788	41.850	0.94964	48.788	0.98242	55.862	1.0268	62.921
56	0.89630	35.275	0.90481	42.045	0.92325	49.141	0.95277	56.396	0.99406	63.645
57	0.87666	35.305	0.88186	42.201	0.89697	49.458	0.92327	56.900	0.96149	64.347
58	0.85716	35.293	0.85902	42.314	0.87082	49.736	0.89393	57.372	0.92912	65.025
59	0.83781	35.238	0.83633	42.383	0.84482	49.973	0.86474	57.811	0.89696	65.681
60	0.81862	35.139	0.81379	42.406	0.81898	50.168	0.83573	58.214	0.86502	66.313
61	0.79961	34.992	0.79144	42.379	0.79331	50.315	0.80692	58.578	0.83332	66.919
62	0.78081	34.794	0.76929	42.299	0.76783	50.412	0.77831	58.902	0.80186	67.497
63	0.76223	34.545	0.74735	42.164	0.74256	50.457	0.74991	59.185	0.77065	68.048
64	0.74390	34.242	0.72565	41.970	0.71752	50.446	0.72173	59.421	0.73969	68.571
65	0.72584	33.881	0.70420	41.713	0.69271	50.373	0.69377	59.608	0.70899	69.064
66	0.70808	33.459	0.68304	41.389	0.66815	50.235	0.66605	59.742	0.67855	69.524
67	0.69063	32.974	0.66218	40.993	0.64385	50.026	0.63858	59.817	0.64836	69.950
68	0.67352	32.423	0.64164	40.520	0.61985	49.739	0.61136	59.828	0.61844	70.340
69	0.65677	31.804	0.62146	39.966	0.59618	49.368	0.58441	59.769	0.58877	70.689
70	0.64043	31.112	0.60166	39.324	0.57283	48.905	0.55775	59.633	0.55937	70.995
71	0.62452	30.344	0.58227	38.589	0.54984	48.342	0.53137	59.410	0.53022	71.253
72	0.60907	29.498	0.56334	37.754	0.52724	47.668	0.50529	59.090	0.50134	71.458
73	0.59410	28.570	0.54489	36.812	0.50506	46.870	0.47955	58.659	0.47271	71.602
74	0.57966	27.558	0.52697	35.756	0.48335	45.937	0.45414	58.104	0.44434	71.677
75	0.56579	26.458	0.50963	34.578	0.46215	44.856	0.42910	57.405	0.41622	71.672
76	0.55252	25.269	0.49292	33.271	0.44151	43.610	0.40446	56.542	0.38836	71.573
77	0.53990	23.989	0.47688	31.828	0.42149	42.180	0.38028	55.487	0.36075	71.361
78	0.52796	22.616	0.46159	30.242	0.40216	40.548	0.35658	54.206	0.33339	71.015
79	0.51675	21.151	0.44710	28.507	0.38360	38.692	0.33345	52.659	0.30630	70.501
80	0.50631	19.594	0.43349	26.616	0.36591	36.591	0.31099	50.800	0.27951	69.774
81	0.49669	17.946	0.42083	24.567	0.34921	34.223	0.28928	48.566	0.25304	68.774
82	0.48794	16.210	0.40919	22.359	0.33362	31.569	0.26848	45.888	0.22691	67.413
83	0.48009	14.391	0.39867	19.993	0.31928	28.608	0.24877	42.681	0.20122	65.561
84	0.47320	12.495	0.38935	17.475	0.30635	25.333	0.23039	38.853	0.17608	63.018
85	0.46730	10.529	0.38129	14.813	0.29499	21.739	0.21368	34.303	0.15169	59.474
86	0.46241	8.501	0.37457	12.022	0.28538	17.838	0.19902	28.949	0.12853	54.420
87	0.45857	6.422	0.36927	9.121	0.27770	13.659	0.18684	22.746	0.10710	47.029
88	0.45581	4.304	0.36545	6.132	0.27208	9.247	0.17765	15.729	0.08871	36.059
89	0.45415	2.159	0.36314	3.081	0.26865	4.668	0.17193	8.051	0.07570	20.198
90	0.45360	0.000	0.36236	0.000	0.26750	0.000	0.16997	0.000	0.07074	0.000

Examples. $\cosh(1.3 \underline{/73°}) = 0.50506 \underline{/46°.870} = 0.50506 \underline{/46°.52'.12''}.$
$\cosh^{-1}(0.07074 \underline{/0°}) = 1.5 \underline{/90°}.$

Table II. HYPERBOLIC COSINES. $\cosh(\rho \,/\underline{\delta}) = r \,/\underline{\gamma}$. Continued

	1.6		1.7		1.8		1.9		2.0	
°		°		°		°		°		°
45	1.4524	59.916	1.5556	65.149	1.6714	70.229	1.7999	75.152	1.9413	79.922
46	1.4149	60.974	1.5141	66.336	1.6257	71.536	1.7496	76.569	1.8861	81.437
47	1.3774	62.021	1.4727	67.516	1.5802	72.837	1.6997	77.979	1.8313	82.947
48	1.3400	63.051	1.4316	68.681	1.5350	74.125	1.6502	79.378	1.7771	84.445
49	1.3028	64.066	1.3906	69.833	1.4901	75.403	1.6012	80.768	1.7235	85.935
50	1.2657	65.065	1.3499	70.973	1.4456	76.671	1.5526	82.149	1.6706	87.417
51	1.2287	66.049	1.3095	72.100	1.4015	77.929	1.5046	83.522	1.6184	88.890
52	1.1919	67.018	1.2693	73.217	1.3579	79.179	1.4572	84.890	1.5669	90.356
53	1.1554	67.971	1.2295	74.324	1.3147	80.422	1.4104	86.252	1.5162	91.817
54	1.1191	68.909	1.1900	75.421	1.2719	81.659	1.3643	87.609	1.4664	93.275
55	1.0831	69.833	1.1509	76.508	1.2297	82.892	1.3188	88.963	1.4174	94.731
56	1.0473	70.744	1.1121	77.589	1.1879	84.122	1.2740	90.318	1.3693	96.188
57	1.0118	71.640	1.0737	78.663	1.1467	85.350	1.2299	91.674	1.3221	97.646
58	0.97653	72.522	1.0358	79.730	1.1061	86.576	1.1865	93.032	1.2758	99.108
59	0.94160	73.392	0.99826	80.795	1.0661	87.808	1.1439	94.398	1.2305	100.577
60	0.90699	74.249	0.96117	81.859	1.0266	89.045	1.1020	95.773	1.1861	102.057
61	0.87268	75.094	0.92451	82.919	0.98772	90.287	1.0609	97.158	1.1427	103.548
62	0.83871	75.926	0.88831	83.982	0.94946	91.540	1.0207	98.559	1.1003	105.054
63	0.80508	76.748	0.85256	85.048	0.91182	92.807	0.98119	99.978	1.0589	106.580
64	0.77177	77.561	0.81727	86.121	0.87480	94.092	0.94254	101.420	1.0186	108.129
65	0.73879	78.365	0.78245	87.204	0.83842	95.400	0.90472	102.891	0.97928	109.707
66	0.70615	79.161	0.74810	88.300	0.80268	96.734	0.86773	104.394	0.94100	111.318
67	0.67383	79.951	0.71420	89.415	0.76759	98.101	0.86160	105.937	0.90378	112.968
68	0.64184	80.736	0.68078	90.551	0.73314	99.508	0.79631	107.527	0.86764	114.663
69	0.61019	81.519	0.64782	91.717	0.69935	100.962	0.76190	109.170	0.83259	116.410
70	0.57887	82.300	0.61533	92.917	0.66624	102.473	0.72838	110.875	0.79865	118.215
71	0.54786	83.084	0.58331	94.161	0.63379	104.050	0.69576	112.653	0.76583	120.087
72	0.51715	83.872	0.55175	95.458	0.60202	105.706	0.66406	114.514	0.73414	122.035
73	0.48674	84.668	0.52065	96.819	0.57095	107.453	0.63329	116.471	0.70361	124.068
74	0.45663	85.477	0.49003	98.258	0.54061	109.308	0.60349	118.537	0.67428	126.197
75	0.42680	86.304	0.45988	99.793	0.51100	111.291	0.57470	120.726	0.64618	128.432
76	0.39724	87.156	0.43021	101.445	0.48217	113.423	0.54696	123.058	0.61934	130.785
77	0.36794	88.041	0.40104	103.241	0.45415	115.732	0.52030	125.550	0.59381	133.267
78	0.33888	88.972	0.37238	105.215	0.42701	118.248	0.49480	128.224	0.56965	135.890
79	0.31006	89.963	0.34428	107.409	0.40082	121.008	0.47055	131.100	0.54691	138.664
80	0.28146	91.036	0.31679	109.880	0.37567	124.055	0.44764	134.201	0.52568	141.601
81	0.25309	92.221	0.28997	112.701	0.35167	127.438	0.42617	137.553	0.50603	144.713
82	0.22494	93.561	0.26395	115.971	0.32897	131.210	0.40626	141.172	0.48805	148.003
83	0.19700	95.128	0.23887	119.816	0.30779	135.433	0.38806	145.082	0.47184	151.474
84	0.16926	97.033	0.21497	124.413	0.28838	140.167	0.37174	149.292	0.45750	155.127
85	0.14177	99.473	0.19261	129.984	0.27102	145.463	0.35749	153.806	0.44514	158.954
86	0.11467	102.829	0.17231	136.806	0.25603	151.356	0.34550	158.614	0.43486	162.943
87	0.08809	107.920	0.15476	145.176	0.24378	157.847	0.33593	163.691	0.42674	167.072
88	0.06261	116.850	0.14093	155.306	0.23469	164.877	0.32895	168.991	0.42088	171.315
89	0.04025	136.057	0.13195	167.116	0.22911	172.324	0.32472	174.453	0.41734	175.637
90	0.02920	180.000	0.12884	180.000	0.22720	180.000	0.32329	180.000	0.41615	180.000

Examples. $\cosh(2.0 \,/\underline{90^\circ}) = 0.41615 \,/\underline{180^\circ}$.
$\cosh^{-1}(0.54691 \,/\underline{138^\circ.664}) = 2.0 \,/\underline{79^\circ}$.

	2.1		2.2		2.3		2.4		2.5	
°		°		°		°		°		°
45	2.0958	84.551	2.2636	89.050	2.4449	93.438	2.6403	97.730	2.8502	101.944
46	2.0350	86.159	2.1966	90.740	2.3711	95.202	2.5589	99.564	2.7603	103.842
47	1.9749	87.755	2.1306	92.417	2.2984	96.952	2.4788	101.380	2.6720	105.720
48	1.9155	89.341	2.0655	94.081	2.2269	98.687	2.4001	103.179	2.5853	107.578
49	1.8569	90.917	2.0013	95.734	2.1567	100.408	2.3229	104.962	2.5004	109.417
50	1.7992	92.484	1.9382	97.376	2.0877	102.116	2.2473	106.729	2.4173	111.238
51	1.7424	94.043	1.8763	99.009	2.0200	103.812	2.1732	108.482	2.3361	113.041
52	1.6865	95.594	1.8155	100.633	1.9537	105.498	2.1008	110.220	2.2568	114.826
53	1.6316	97.140	1.7559	102.249	1.8889	107.173	2.0301	111.944	2.1795	116.593
54	1.5777	98.681	1.6976	103.858	1.8255	108.838	1.9612	113.656	2.1042	118.344
55	1.5249	100.220	1.6406	105.462	1.7637	110.495	1.8940	115.356	2.0310	120.079
56	1.4732	101.758	1.5848	107.063	1.7034	112.145	1.8286	117.045	1.9599	121.799
57	1.4226	103.296	1.5303	108.662	1.6447	113.789	1.7651	118.724	1.8909	123.504
58	1.3731	104.836	1.4772	110.261	1.5876	115.430	1.7035	120.394	1.8241	125.195
59	1.3248	106.382	1.4256	111.862	1.5322	117.069	1.6438	122.057	1.7594	126.874
60	1.2776	107.936	1.3754	113.467	1.4784	118.708	1.5859	123.715	1.6969	128.541
61	1.2317	109.501	1.3266	115.079	1.4262	120.347	1.5299	125.369	1.6366	130.198
62	1.1870	111.079	1.2792	116.700	1.3758	121.991	1.4758	127.020	1.5785	131.846
63	1.1435	112.673	1.2332	118.333	1.3270	123.641	1.4237	128.671	1.5226	133.486
64	1.1012	114.288	1.1887	119.982	1.2799	125.300	1.3736	130.322	1.4689	135.120
65	1.0602	115.928	1.1457	121.650	1.2345	126.970	1.3254	131.977	1.4173	136.749
66	1.0204	117.597	1.1042	123.339	1.1908	128.654	1.2791	133.638	1.3679	138.374
67	0.98193	119.299	1.0642	125.055	1.1488	130.355	1.2347	135.306	1.3207	139.998
68	0.94474	121.041	1.0256	126.801	1.1086	132.077	1.1923	136.985	1.2756	141.622
69	0.90886	122.827	0.98860	128.581	1.0700	133.823	1.1518	138.676	1.2327	143.247
70	0.87429	124.662	0.95308	130.400	1.0332	135.595	1.1132	140.382	1.1919	144.876
71	0.84105	126.554	0.91908	132.263	0.99804	137.397	1.0765	142.106	1.1532	146.511
72	0.80915	128.509	0.88663	134.174	0.96464	139.233	1.0417	143.850	1.1166	148.153
73	0.77861	130.533	0.85573	136.137	0.93297	141.106	1.0088	145.616	1.0821	149.803
74	0.74945	132.634	0.82638	138.158	0.90303	143.019	0.97785	147.407	1.0497	151.464
75	0.72171	134.818	0.79862	140.242	0.87481	144.976	0.94877	149.225	1.0193	153.137
76	0.69541	137.094	0.77246	142.393	0.84833	146.980	0.92156	151.071	0.99093	154.823
77	0.67060	139.468	0.74789	144.615	0.82360	149.033	0.89622	152.948	0.96459	156.524
78	0.64732	141.946	0.72497	146.911	0.80062	151.136	0.87276	154.857	0.94026	158.241
79	0.62558	144.534	0.70372	149.285	0.77940	153.291	0.85117	156.798	0.91793	159.974
80	0.60544	147.237	0.68416	151.738	0.75996	155.499	0.83145	158.771	0.89757	161.723
81	0.58697	150.058	0.66632	154.271	0.74231	157.760	0.81361	160.778	0.87918	163.490
82	0.57021	152.997	0.65024	156.883	0.72646	160.074	0.79764	162.817	0.86276	165.274
83	0.55523	156.054	0.63595	159.572	0.71244	162.438	0.78354	164.888	0.84829	167.074
84	0.54209	159.225	0.62349	162.334	0.70025	164.848	0.77131	166.987	0.83575	168.889
85	0.53085	162.503	0.61287	165.164	0.68990	167.301	0.76095	169.112	0.82518	170.717
86	0.52156	165.876	0.60413	168.054	0.68141	169.793	0.75247	171.260	0.81650	172.558
87	0.51428	169.329	0.59731	170.994	0.67479	172.316	0.74587	173.427	0.80979	174.409
88	0.50905	172.849	0.59242	173.973	0.67006	174.863	0.74116	175.610	0.80499	176.269
89	0.50590	176.413	0.58948	176.980	0.66722	177.427	0.73834	177.803	0.80207	178.134
90	0.50485	180.000	0.58850	180.000	0.66628	180.000	0.73740	180.000	0.80114	180.000

Examples. $\cosh (2.2 \underline{/45^\circ}) = 2.2636 \underline{/89^\circ.050} = 2.2636 \underline{/89^\circ.03'.00''}$.
$\cosh^{-1} (1.0821 \underline{/149^\circ.803}) = 2.5 \underline{/73^\circ}$.

	2.6		2.7		2.8		2.9		3.0	
°		°		°		°		°		°
45	3.0753	106.093	3.3163	110.190	3.5741	114.248	3.8497	118.275	4.1443	122.282
46	2.9758	108.051	3.2062	112.207	3.4523	116.322	3.7146	120.406	3.9945	124.469
47	2.8783	109.987	3.0984	114.199	3.3329	118.368	3.5826	122.506	3.8483	126.623
48	2.7827	111.901	2.9928	116.166	3.2162	120.387	3.4536	124.575	3.7057	128.743
49	2.6891	113.793	2.8896	118.108	3.1023	122.378	3.3278	126.614	3.5667	130.828
50	2.5977	115.663	2.7889	120.025	2.9913	124.340	3.2053	128.621	3.4315	132.879
51	2.5085	117.512	2.6908	121.917	2.8832	126.273	3.0861	130.595	3.3001	134.894
52	2.4216	119.340	2.5952	123.784	2.7780	128.177	2.9703	132.536	3.1726	136.873
53	2.3369	121.147	2.5023	125.626	2.6759	130.052	2.8580	134.444	3.0490	138.815
54	2.2545	122.931	2.4120	127.442	2.5769	131.898	2.7492	136.320	2.9294	140.720
55	2.1745	124.695	2.3245	129.233	2.4809	133.715	2.6439	138.162	2.8137	142.587
56	2.0970	126.440	2.2397	131.000	2.3880	135.502	2.5421	139.969	2.7020	144.415
57	2.0219	128.165	2.1577	132.742	2.2983	137.259	2.4439	141.742	2.5943	146.203
58	1.9492	129.872	2.0785	134.460	2.2118	138.987	2.3492	143.479	2.4905	147.951
59	1.8790	131.560	2.0021	136.154	2.1284	140.685	2.2580	145.180	2.3907	149.659
60	1.8113	133.231	1.9284	137.824	2.0481	142.354	2.1703	146.846	2.2949	151.325
61	1.7460	134.885	1.8575	139.471	1.9709	143.993	2.0861	148.476	2.2030	152.949
62	1.6832	136.523	1.7894	141.095	1.8968	145.601	2.0053	150.071	2.1148	154.530
63	1.6229	138.146	1.7241	142.696	1.8259	147.179	1.9280	151.627	2.0304	156.067
64	1.5650	139.754	1.6615	144.276	1.7580	148.728	1.8541	153.146	1.9498	157.559
65	1.5096	141.349	1.6016	145.834	1.6931	150.247	1.7835	154.628	1.8729	159.005
66	1.4566	142.932	1.5445	147.371	1.6311	151.737	1.7162	156.071	1.7997	160.406
67	1.4060	144.504	1.4900	148.887	1.5721	153.198	1.6522	157.477	1.7301	161.759
68	1.3578	146.066	1.4382	150.384	1.5161	154.628	1.5914	158.844	1.6640	163.064
69	1.3120	147.620	1.3889	151.863	1.4629	156.030	1.5338	160.172	1.6013	164.321
70	1.2685	149.164	1.3422	153.322	1.4126	157.404	1.4793	161.460	1.5420	165.528
71	1.2273	150.705	1.2981	154.764	1.3650	158.749	1.4278	162.709	1.4861	166.685
72	1.1885	152.239	1.2565	156.189	1.3202	160.066	1.3793	163.919	1.4335	167.792
73	1.1519	153.770	1.2174	157.599	1.2782	161.355	1.3338	165.090	1.3840	168.848
74	1.1176	155.298	1.1807	158.994	1.2388	162.617	1.2912	166.222	1.3377	169.853
75	1.0855	156.825	1.1465	160.374	1.2020	163.853	1.2514	167.315	1.2946	170.806
76	1.0556	158.351	1.1147	161.742	1.1677	165.063	1.2144	168.370	1.2545	171.708
77	1.0278	159.878	1.0852	163.096	1.1360	166.248	1.1802	169.387	1.2174	172.560
78	1.0022	161.406	1.0580	164.440	1.1069	167.409	1.1486	170.368	1.1832	173.362
79	0.97880	162.937	1.0331	165.773	1.0803	168.547	1.1200	171.313	1.1519	174.116
80	0.95745	164.471	1.0105	167.096	1.0561	169.664	1.0938	172.225	1.1235	174.823
81	0.93821	166.008	0.99006	168.411	1.0342	170.760	1.0702	173.104	1.0979	175.485
82	0.92106	167.549	0.97189	169.718	1.0147	171.837	1.0492	173.953	1.0751	176.104
83	0.90596	169.094	0.95592	171.018	0.99765	172.897	1.0307	174.774	1.0550	176.685
84	0.89290	170.643	0.94211	172.312	0.98287	173.942	1.0148	175.571	1.0377	177.229
85	0.88187	172.196	0.93045	173.601	0.97041	174.973	1.0014	176.344	1.0231	177.742
86	0.87286	173.752	0.92093	174.886	0.96025	175.993	0.99042	177.099	1.0112	178.228
87	0.86587	175.311	0.91354	176.168	0.95235	177.003	0.98190	177.838	1.0019	178.691
88	0.86089	176.873	0.90827	177.447	0.94671	178.006	0.97582	178.566	0.99528	179.137
89	0.85789	178.436	0.90512	178.724	0.94334	179.004	0.97217	179.285	0.99130	179.571
90	0.85689	180.000	0.90407	180.000	0.94222	180.000	0.97096	180.000	0.98999	180.000

Examples. cosh $(2.8 \angle 85^\circ) = 0.97041 \angle 174^\circ.973 = 0.97041 \angle 174^\circ.58'.23''$.
$\cosh^{-1} (1.5420 \angle 165^\circ.528) = 3.0 \angle 70^\circ$.

TABLE III. HYPERBOLIC TANGENTS. $\tanh (\rho \underline{/\delta}) = r \underline{/\gamma}$

°	0.1	°	0.2	°	0.3	°	0.4	°	0.5	°
45	0.10000	44.812	0.19997	44.235	0.29981	43.282	0.39921	41.954	0.49757	40.250
46	0.10001	45.812	0.20006	45.236	0.30012	44.281	0.39995	42.945	0.49902	41.229
47	0.10002	46.812	0.20015	46.237	0.30043	45.280	0.40069	43.942	0.50047	42.219
48	0.10003	47.812	0.20024	47.239	0.30075	46.283	0.40143	44.942	0.50192	43.213
49	0.10004	48.813	0.20034	48.242	0.30107	47.290	0.40217	45.947	0.50340	44.213
50	0.10006	49.813	0.20043	49.245	0.30138	48.297	0.40293	46.955	0.50490	45.220
51	0.10007	50.813	0.20053	50.251	0.30169	49.306	0.40370	47.969	0.50639	46.233
52	0.10008	51.814	0.20062	51.256	0.30201	50.315	0.40446	48.986	0.50789	47.252
53	0.10009	52.816	0.20071	52.262	0.30232	51.328	0.40521	50.005	0.50939	48.276
54	0.10010	53.818	0.20081	53.268	0.30263	52.344	0.40596	51.031	0.51089	49.308
55	0.10011	54.820	0.20090	54.276	0.30294	53.362	0.40671	52.058	0.51239	50.344
56	0.10013	55.823	0.20099	55.285	0.30325	54.382	0.40746	53.089	0.51389	51.388
57	0.10014	56.825	0.20107	56.295	0.30355	55.404	0.40820	54.124	0.51538	52.439
58	0.10015	57.828	0.20115	57.306	0.30385	56.426	0.40892	55.164	0.51687	53.494
59	0.10016	58.830	0.20124	58.318	0.30414	57.452	0.40964	56.207	0.51835	54.556
60	0.10017	59.833	0.20132	59.332	0.30444	58.479	0.41037	57.255	0.51983	55.625
61	0.10018	60.837	0.20140	60.345	0.30473	59.510	0.41107	58.305	0.52128	56.700
62	0.10019	61.841	0.20148	61.360	0.30501	60.542	0.41176	59.359	0.52271	57.781
63	0.10020	62.845	0.20156	62.375	0.30528	61.575	0.41244	60.417	0.52412	58.867
64	0.10020	63.849	0.20164	63.391	0.30555	62.610	0.41311	61.479	0.52552	59.959
65	0.10021	64.853	0.20171	64.408	0.30580	63.647	0.41376	62.544	0.52689	61.058
66	0.10022	65.857	0.20179	65.425	0.30605	64.686	0.41441	63.612	0.52824	62.164
67	0.10023	66.862	0.20186	66.443	0.30630	65.727	0.41504	64.685	0.52957	63.276
68	0.10024	67.866	0.20193	67.461	0.30655	66.769	0.41565	65.760	0.53085	64.391
69	0.10025	68.871	0.20199	68.480	0.30678	67.813	0.41623	66.837	0.53209	65.511
70	0.10026	69.877	0.20206	69.501	0.30701	68.859	0.41680	67.918	0.53330	66.638
71	0.10026	70.882	0.20212	70.522	0.30722	69.906	0.41735	69.002	0.53446	67.771
72	0.10027	71.888	0.20217	71.544	0.30742	70.955	0.41788	70.089	0.53560	68.909
73	0.10028	72.893	0.20223	72.566	0.30762	72.005	0.41838	71.179	0.53669	70.052
74	0.10028	73.898	0.20228	73.589	0.30781	73.056	0.41886	72.272	0.53773	71.200
75	0.10029	74.904	0.20234	74.612	0.30799	74.108	0.41932	73.368	0.53872	72.351
76	0.10029	75.910	0.20239	75.635	0.30816	75.162	0.41975	74.466	0.53965	73.507
77	0.10030	76.916	0.20243	76.659	0.30831	76.217	0.42016	75.566	0.54054	74.667
78	0.10030	77.922	0.20246	77.684	0.30846	77.273	0.42054	76.668	0.54138	75.831
79	0.10031	78.928	0.20250	78.709	0.30860	78.329	0.42088	77.771	0.54215	76.999
80	0.10031	79.934	0.20254	79.734	0.30872	79.386	0.42120	78.876	0.54285	78.170
81	0.10032	80.940	0.20257	80.759	0.30884	80.445	0.42150	79.983	0.54349	79.344
82	0.10032	81.946	0.20260	81.785	0.30894	81.506	0.42177	81.092	0.54407	80.520
83	0.10032	82.953	0.20263	82.812	0.30904	82.567	0.42201	82.203	0.54459	81.699
84	0.10033	83.960	0.20265	83.838	0.30912	83.628	0.42222	83.315	0.54503	82.881
85	0.10033	84.967	0.20267	84.864	0.30920	84.689	0.42239	84.427	0.54540	84.065
86	0.10033	85.974	0.20268	85.891	0.30926	85.751	0.42252	85.540	0.54571	85.251
87	0.10033	86.981	0.20270	86.918	0.30930	86.813	0.42264	86.654	0.54596	86.438
88	0.10033	87.988	0.20270	87.946	0.30933	87.875	0.42274	87.768	0.54616	87.626
89	0.10033	88.994	0.20271	88.973	0.30934	88.937	0.42279	88.883	0.54628	88.813
90	0.10033	90.000	0.20271	90.000	0.30934	90.000	0.42280	90.000	0.54631	90.000

Note. $\tanh (0 \underline{/\delta}) = 0 \underline{/\gamma}.$

Examples. $\tanh (0.5 \underline{/60^\circ}) = 0.51983 \underline{/55^\circ.625} = 0.51983 \underline{/55^\circ.37'.30''}.$

$\tanh^{-1} (0.54628 \underline{/88^\circ.813}) = 0.5 \underline{/89^\circ}.$

	0.6		0.7		0.8		0.9		1.0	
°		°		°		°		°		°
45	0.59406	38.183	0.68732	35.786	0.77577	33.098	0.85756	30.161	0.93077	27.044
46	0.59650	39.146	0.69109	36.719	0.78117	33.980	0.86480	30.980	0.93909	27.784
47	0.59898	40.119	0.69495	37.663	0.78671	34.878	0.87229	31.815	0.94950	28.539
48	0.60149	41.099	0.69888	38.617	0.79240	35.790	0.88001	32.666	0.95938	29.308
49	0.60403	42.088	0.70287	39.581	0.79824	36.715	0.88799	33.531	0.96966	30.092
50	0.60660	43.085	0.70694	40.557	0.80421	37.653	0.89620	34.412	0.98032	30.892
51	0.60920	44.092	0.71107	41.545	0.81031	38.605	0.90466	35.310	0.99136	31.710
52	0.61182	45.107	0.71527	42.543	0.81655	39.573	0.91337	36.223	1.00282	32.545
53	0.61447	46.130	0.71952	43.555	0.82291	40.556	0.92231	37.155	1.01469	33.400
54	0.61713	47.162	0.72382	44.577	0.82940	41.554	0.93150	38.105	1.02697	34.274
55	0.61980	48.203	0.72817	45.612	0.83601	42.568	0.94094	39.075	1.03970	35.172
56	0.62248	49.254	0.73257	46.662	0.84274	43.599	0.95063	40.066	1.05287	36.091
57	0.62517	50.315	0.73700	47.725	0.84957	44.647	0.96056	41.078	1.06648	37.035
58	0.62785	51.384	0.74145	48.800	0.85649	45.712	0.97069	42.111	1.08054	38.004
59	0.63053	52.463	0.74593	49.888	0.86351	46.797	0.98106	43.167	1.09506	39.002
60	0.63322	53.552	0.75047	50.990	0.87063	47.900	0.99168	44.247	1.11009	40.026
61	0.63588	54.650	0.75499	52.107	0.87781	49.022	1.00251	45.353	1.12555	41.082
62	0.63852	55.758	0.75950	53.238	0.88504	50.165	1.01353	46.486	1.14144	42.168
63	0.64115	56.876	0.76400	54.383	0.89232	51.327	1.02471	47.645	1.15777	43.289
64	0.64376	58.002	0.76848	55.542	0.89965	52.509	1.03604	48.831	1.17454	44.445
65	0.64633	59.138	0.77294	56.716	0.90698	53.712	1.04753	50.044	1.19173	45.638
66	0.64886	60.284	0.77737	57.902	0.91433	54.936	1.05916	51.289	1.20935	46.869
67	0.65135	61.439	0.78177	59.105	0.92166	56.180	1.07090	52.562	1.22737	48.140
68	0.65380	62.603	0.78609	60.322	0.92894	57.448	1.08268	53.868	1.24569	49.455
69	0.65618	63.777	0.79033	61.553	0.93616	58.737	1.09447	55.204	1.26429	50.812
70	0.65850	64.959	0.79450	62.798	0.94332	60.047	1.10627	56.572	1.28316	52.215
71	0.66075	66.150	0.79858	64.057	0.95037	61.379	1.11803	57.974	1.30221	53.666
72	0.66294	67.350	0.80256	65.329	0.95727	62.732	1.12972	59.408	1.32140	55.164
73	0.66505	68.559	0.80641	66.614	0.96402	64.106	1.14126	60.874	1.34063	56.710
74	0.66708	69.775	0.81014	67.913	0.97060	65.501	1.15260	62.372	1.35986	58.307
75	0.66902	70.998	0.81371	69.225	0.97697	66.917	1.16370	63.903	1.37894	59.957
76	0.67086	72.228	0.81713	70.550	0.98311	68.352	1.17450	65.468	1.39775	61.658
77	0.67261	73.466	0.82038	71.886	0.98898	69.808	1.18493	67.064	1.41620	63.409
78	0.67425	74.711	0.82345	73.233	0.99455	71.282	1.19495	68.691	1.43412	65.212
79	0.67577	75.962	0.82632	74.591	0.99981	72.773	1.20447	70.347	1.45141	67.065
80	0.67718	77.219	0.82899	75.958	1.00473	74.282	1.21344	72.034	1.46790	68.968
81	0.67847	78.481	0.83144	77.334	1.00926	75.805	1.22179	73.746	1.48345	70.919
82	0.67964	79.749	0.83366	78.719	1.01339	77.344	1.22946	75.483	1.49790	72.913
83	0.68068	81.021	0.83564	80.112	1.01710	78.896	1.23640	77.243	1.51110	74.948
84	0.68159	82.296	0.83738	81.512	1.02036	80.460	1.24253	79.025	1.52289	77.023
85	0.68236	83.575	0.83887	82.917	1.02316	82.034	1.24781	80.825	1.53314	79.132
86	0.68299	84.856	0.84009	84.328	1.02548	83.617	1.25219	82.640	1.54170	81.269
87	0.68349	86.140	0.84105	85.743	1.02730	85.206	1.25566	84.468	1.54848	83.429
88	0.68385	87.426	0.84173	87.161	1.02860	86.801	1.25814	86.308	1.55339	85.609
89	0.68406	88.713	0.84214	88.580	1.02937	88.400	1.25963	88.153	1.55637	87.802
90	0.68413	90.000	0.84229	90.000	1.02960	90.000	1.26015	90.000	1.55740	90.000

Eaxmples. $\tanh(0.9 \underline{/77^\circ}) = 1.18493 \underline{/67^\circ.064} = 1.18493 \underline{/67^\circ.03'.50''}$.
$\tanh^{-1}(0.66708 \underline{/69^\circ.775}) = 0.6 \underline{/74^\circ}$.

	1.1		1.2		1.3		1.4		1.5	
°		°		°		°		°		°
45	0.99389	23.833	1.0457	20.616	1.0857	17.464	1.1143	14.484	1.1323	11.712
46	1.0049	24.476	1.0582	21.144	1.0993	17.882	1.1284	14.775	1.1464	11.884
47	1.0164	25.131	1.0713	21.685	1.1136	18.301	1.1433	15.064	1.1613	12.048
48	1.0283	25.799	1.0851	22.236	1.1286	18.721	1.1590	15.352	1.1770	12.208
49	1.0408	26.480	1.0995	22.798	1.1445	19.148	1.1756	15.640	1.1936	12.362
50	1.0539	27.178	1.1147	23.371	1.1613	19.584	1.1932	15.930	1.2112	12.510
51	1.0676	27.891	1.1307	23.957	1.1789	20.027	1.2118	16.222	1.2299	12.652
52	1.0818	28.621	1.1474	24.558	1.1976	20.479	1.2315	16.515	1.2498	12.787
53	1.0967	29.370	1.1650	25.174	1.2173	20.941	1.2524	16.811	1.2709	12.914
54	1.1122	30.139	1.1835	25.807	1.2381	21.414	1.2746	17.110	1.2933	13.035
55	1.1284	30.930	1.2030	26.460	1.2602	21.900	1.2982	17.413	1.3172	13.151
56	1.1453	31.744	1.2235	27.133	1.2836	22.401	1.3234	17.721	1.3427	13.262
57	1.1629	32.583	1.2450	27.827	1.3084	22.918	1.3502	18.036	1.3700	13.366
58	1.1813	33.449	1.2677	28.546	1.3346	23.452	1.3787	18.358	1.3992	13.466
59	1.2005	34.343	1.2916	29.292	1.3626	24.007	1.4093	18.689	1.4305	13.559
60	1.2206	35.267	1.3168	30.068	1.3923	24.584	1.4421	19.032	1.4642	13.651
61	1.2415	36.226	1.3434	30.876	1.4239	25.187	1.4772	19.389	1.5005	13.738
62	1.2632	37.222	1.3714	31.720	1.4576	25.820	1.5148	19.761	1.5396	13.824
63	1.2858	38.255	1.4009	32.603	1.4935	26.485	1.5553	20.150	1.5819	13.908
64	1.3094	39.328	1.4321	33.527	1.5319	27.186	1.5990	20.562	1.6277	13.991
65	1.3339	40.446	1.4649	34.498	1.5729	27.928	1.6463	20.999	1.6776	14.076
66	1.3593	41.612	1.4995	35.520	1.6167	28.715	1.6974	21.465	1.7319	14.166
67	1.3856	42.827	1.5359	36.597	1.6637	29.554	1.7528	21.966	1.7914	14.261
68	1.4129	44.096	1.5743	37.737	1.7140	30.452	1.8131	22.507	1.8566	14.364
69	1.4411	45.421	1.6148	38.941	1.7680	31.415	1.8788	23.096	1.9285	14.480
70	1.4702	46.806	1.6573	40.219	1.8260	32.452	1.9506	23.740	2.0078	14.612
71	1.5001	48.256	1.7020	41.575	1.8882	33.570	2.0293	24.448	2.0959	14.765
72	1.5307	49.773	1.7488	43.017	1.9551	34.782	2.1158	25.232	2.1942	14.944
73	1.5620	51.361	1.7977	44.553	2.0269	36.101	2.2111	26.106	2.3043	15.159
74	1.5938	53.022	1.8488	46.190	2.1041	37.539	2.3164	27.084	2.4285	15.419
75	1.6261	54.762	1.9019	47.936	2.1869	39.110	2.4332	28.186	2.5694	15.734
76	1.6585	56.581	1.9568	49.798	2.2757	40.830	2.5631	29.433	2.7303	16.120
77	1.6910	58.482	2.0134	51.786	2.3706	42.720	2.7078	30.855	2.9157	16.597
78	1.7232	60.468	2.0713	53.906	2.4716	44.798	2.8697	32.486	3.1312	17.186
79	1.7550	62.538	2.1299	56.165	2.5786	47.088	3.0509	34.367	3.3843	17.924
80	1.7858	64.692	2.1887	58.571	2.6912	49.611	3.2536	36.546	3.6845	18.856
81	1.8155	66.931	2.2471	61.126	2.8085	52.391	3.4807	39.085	4.0459	20.044
82	1.8435	69.252	2.3040	63.832	2.9290	55.447	3.7337	42.056	4.4876	21.578
83	1.8696	71.650	2.3585	66.690	3.0506	58.800	4.0135	45.546	5.0365	23.588
84	1.8933	74.121	2.4094	69.694	3.1704	62.460	4.3188	49.646	5.7311	26.276
85	1.9142	76.657	2.4555	72.836	3.2845	66.432	4.6429	54.459	6.6297	29.955
86	1.9318	79.252	2.4955	76.102	3.3884	70.706	4.9729	60.069	7.8015	35.134
87	1.9460	81.895	2.5281	79.475	3.4767	75.253	5.2871	66.523	9.3413	42.644
88	1.9564	84.575	2.5523	82.933	3.5446	80.030	5.5531	73.786	11.259	53.726
89	1.9627	87.281	2.5671	86.452	3.5875	84.971	5.7333	81.707	13.182	69.695
90	1.9648	90.000	2.5721	90.000	3.6021	90.000	5.9978	90.000	14.101	90.000

Examples. $\tanh(1.4 \angle 64^\circ) = 1.5990 \angle 20^\circ.562 = 1.5990 \angle 20^\circ.33'.43''$.
$\tanh^{-1}(1.7550 \angle 62^\circ.538 = 1.1 \angle 79^\circ$.

TABLE III. HYPERBOLIC TANGENTS. $\tanh(\rho \underline{/\delta}) = r \underline{/\gamma}$. CONTINUED

°	1.6	°	1.7	°	1.8	°	1.9	°	2.0	°
45	1.1413	9.201	1.1428	6.984	1.1385	5.063	1.1302	3.438	1.1191	2.094
46	1.1548	9.267	1.1553	6.952	1.1499	4.950	1.1401	3.260	1.1275	1.867
47	1.1691	9.318	1.1686	6.902	1.1618	4.814	1.1505	3.058	1.1363	1.613
48	1.1842	9.358	1.1826	6.834	1.1743	4.659	1.1614	2.832	1.1455	1.333
49	1.2002	9.385	1.1974	6.749	1.1876	4.480	1.1728	2.578	1.1550	1.023
50	1.2171	9.400	1.2131	6.645	1.2016	4.275	1.1848	2.295	1.1650	0.681
51	1.2351	9.400	1.2296	6.520	1.2163	4.045	1.1975	1.981	1.1754	0.306
52	1.2541	9.384	1.2472	6.373	1.2318	3.787	1.2107	1.634	1.1863	**0.103**
53	1.2744	9.354	1.2659	6.203	1.2483	3.499	1.2247	1.253	1.1977	**0.550**
54	1.2960	9.309	1.2857	6.008	1.2657	3.180	1.2394	0.835	1.2096	**1.039**
55	1.3190	9.246	1.3067	5.788	1.2842	2.826	1.2549	0.379	1.2220	**1.571**
56	1.3435	9.166	1.3292	5.539	1.3038	2.436	1.2713	**0.121**	1.2350	**2.149**
57	1.3698	9.069	1.3532	5.261	1.3247	2.008	1.2886	**0.666**	1.2487	**2.777**
58	1.3979	8.953	1.3788	4.953	1.3469	1.540	1.3069	**1.259**	1.2630	**3.458**
59	1.4281	8.817	1.4063	4.611	1.3706	1.026	1.3263	**1.905**	1.2781	**4.195**
60	1.4606	8.661	1.4358	4.232	1.3959	0.465	1.3470	**2.606**	1.2939	**4.995**
61	1.4956	8.484	1.4675	3.819	1.4230	**0.145**	1.3689	**3.366**	1.3106	**5.860**
62	1.5334	8.286	1.5017	3.365	1.4521	**0.810**	1.3922	**4.191**	1.3281	**6.793**
63	1.5743	8.065	1.5386	2.869	1.4833	**1.533**	1.4170	**5.085**	1.3466	**7.802**
64	1.6187	7.819	1.5785	2.326	1.5169	**2.318**	1.4435	**6.052**	1.3662	**8.891**
65	1.6670	7.548	1.6218	1.734	1.5531	**3.172**	1.4718	**7.099**	1.3868	**10.068**
66	1.7198	7.252	1.6690	1.090	1.5923	**4.098**	1.5022	**8.232**	1.4086	**11.338**
67	1.7777	6.928	1.7206	0.387	1.6347	**5.104**	1.5347	**9.459**	1.4317	**12.707**
68	1.8413	6.575	1.7770	**0.376**	1.6807	**6.196**	1.5696	**10.786**	1.4562	**14.184**
69	1.9116	6.191	1.8389	**1.209**	1.7308	**7.382**	1.6070	**12.221**	1.4821	**15.776**
70	1.9893	5.776	1.9072	**2.116**	1.7854	**8.671**	1.6474	**13.773**	1.5095	**17.490**
71	2.0759	5.326	1.9828	**3.106**	1.8451	**10.074**	1.6908	**15.454**	1.5385	**19.337**
72	2.1728	4.840	2.0667	**4.187**	1.9105	**11.602**	1.7376	**17.273**	1.5693	**21.326**
73	2.2819	4.314	2.1603	**5.371**	1.9823	**13.266**	1.7881	**19.244**	1.6019	**23.466**
74	2.4053	3.744	2.2652	**6.670**	2.0613	**15.084**	1.8425	**21.379**	1.6363	**25.769**
75	2.5461	3.127	2.3834	**8.101**	2.1484	**17.076**	1.9011	**23.692**	1.6725	**28.245**
76	2.7079	2.457	2.5172	**9.685**	2.2446	**19.261**	1.9641	**26.202**	1.7105	**30.905**
77	2.8957	1.726	2.6696	**11.447**	2.3510	**21.664**	2.0317	**28.925**	1.7503	**33.760**
78	3.1157	0.922	2.8442	**13.420**	2.4685	**24.315**	2.1040	**31.881**	1.7917	**36.820**
79	3.3766	0.034	3.0455	**15.644**	2.5984	**27.250**	2.1809	**35.088**	1.8344	**40.093**
80	3.6909	**0.960**	3.2790	**18.175**	2.7416	**30.510**	2.2621	**38.568**	1.8781	**43.590**
81	4.0755	**2.087**	3.5519	**21.083**	2.8987	**34.140**	2.3469	**42.344**	1.9222	**47.319**
82	4.5558	**3.390**	3.8718	**24.466**	3.0700	**38.191**	2.4344	**46.428**	1.9661	**51.281**
83	5.1722	**4.937**	4.2487	**28.446**	3.2540	**42.722**	2.5230	**50.842**	2.0090	**55.474**
84	5.9896	**6.839**	4.6927	**33.199**	3.4477	**47.793**	2.6104	**55.590**	2.0497	**59.894**
85	7.1203	**9.289**	5.2102	**38.945**	3.6459	**53.448**	2.6940	**60.673**	2.0872	**64.528**
86	8.7720	**12.668**	5.7994	**45.956**	3.8392	**59.720**	2.7701	**66.075**	2.1202	**69.359**
87	11.388	**17.791**	6.4356	**54.527**	4.0157	**66.606**	2.8350	**71.768**	2.1476	**74.359**
88	15.990	**26.760**	7.0503	**64.868**	4.1592	**74.043**	2.8849	**77.700**	2.1680	**79.494**
89	24.844	**46.011**	7.5193	**76.896**	4.2531	**81.905**	2.9163	**83.805**	2.1807	**84.723**
90	34.232	**90.000**	7.6968	**90.000**	4.2863	**90.000**	2.9271	**90.000**	2.1850	**90.000**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.6 \underline{/54^\circ}) = 1.2960 \underline{/9^\circ.309} = 1.2960 \underline{/9^\circ.18'.32''}$.

$\tanh(2.0 \underline{/64^\circ}) = 1.3662 \overline{\backslash 8^\circ.891} = 1.3662 \overline{\backslash 8^\circ.53'.28''}$.

$\tanh^{-1}(1.4718 \overline{\backslash 7^\circ.099}) = 1.9 \underline{/65^\circ}$.

	2.1		2.2		2.3		2.4		2.5	
°		°		°		°		°		°
45	1.1065	1.007	1.0932	0.155	1.0799	**0.492**	1.0672	**0.961**	1.0553	**1.283**
46	1.1134	0.746	1.0987	**0.127**	1.0842	**0.783**	1.0702	**1.252**	1.0573	**1.564**
47	1.1206	0.458	1.1044	**0.436**	1.0884	**1.101**	1.0732	**1.567**	1.0592	**1.868**
48	1.1280	0.141	1.1102	**0.774**	1.0927	**1.446**	1.0762	**1.908**	1.0610	**2.195**
49	1.1357	**0.206**	1.1161	**1.142**	1.0970	**1.820**	1.0790	**2.277**	1.0626	**2.548**
50	1.1437	**0.586**	1.1222	**1.542**	1.1013	**2.226**	1.0818	**2.676**	1.0640	**2.929**
51	1.1519	**1.001**	1.1284	**1.978**	1.1056	**2.666**	1.0845	**3.107**	1.0653	**3.340**
52	1.1604	**1.452**	1.1347	**2.452**	1.1099	**3.144**	1.0870	**3.572**	1.0663	**3.782**
53	1.1693	**1.943**	1.1411	**2.965**	1.1142	**3.659**	1.0894	**4.073**	1.0671	**4.256**
54	1.1784	**2.476**	1.1477	**3.520**	1.1185	**4.215**	1.0917	**4.614**	1.0676	**4.766**
55	1.1878	**3.055**	1.1544	**4.120**	1.1227	**4.815**	1.0937	**5.196**	1.0678	**5.314**
56	1.1976	**3.682**	1.1612	**4.769**	1.1268	**5.462**	1.0955	**5.822**	1.0677	**5.903**
57	1.2078	**4.361**	1.1681	**5.469**	1.1309	**6.160**	1.0971	**6.496**	1.0672	**6.534**
58	1.2183	**5.094**	1.1751	**6.226**	1.1348	**6.912**	1.0984	**7.220**	1.0662	**7.211**
59	1.2292	**5.888**	1.1822	**7.042**	1.1386	**7.722**	1.0993	**7.998**	1.0647	**7.938**
60	1.2405	**6.745**	1.1894	**7.921**	1.1422	**8.594**	1.0999	**8.835**	1.0628	**8.718**
61	1.2522	**7.671**	1.1967	**8.869**	1.1457	**9.531**	1.1001	**9.735**	1.0603	**9.556**
62	1.2644	**8.669**	1.2041	**9.889**	1.1490	**10.540**	1.0999	**10.701**	1.0572	**10.455**
63	1.2771	**9.744**	1.2116	**10.988**	1.1520	**11.625**	1.0992	**11.740**	1.0535	**11.419**
64	1.2903	**10.902**	1.2192	**12.171**	1.1548	**12.791**	1.0980	**12.855**	1.0490	**12.455**
65	1.3039	**12.151**	1.2268	**13.443**	1.1573	**14.044**	1.0962	**14.053**	1.0438	**13.567**
66	1.3181	**13.496**	1.2344	**14.810**	1.1595	**15.390**	1.0939	**15.341**	1.0378	**14.761**
67	1.3329	**14.942**	1.2421	**16.280**	1.1613	**16.836**	1.0909	**16.723**	1.0310	**16.044**
68	1.3483	**16.499**	1.2499	**17.858**	1.1628	**18.389**	1.0872	**18.208**	1.0232	**17.424**
69	1.3642	**18.172**	1.2576	**19.552**	1.1639	**20.056**	1.0829	**19.802**	1.0145	**18.906**
70	1.3808	**19.968**	1.2654	**21.370**	1.1645	**21.843**	1.0779	**21.514**	1.0049	**20.500**
71	1.3980	**21.898**	1.2732	**23.319**	1.1647	**23.759**	1.0721	**23.352**	0.99427	**22.215**
72	1.4159	**23.968**	1.2809	**25.405**	1.1644	**25.811**	1.0655	**25.324**	0.98265	**24.061**
73	1.4344	**26.185**	1.2885	**27.636**	1.1637	**28.006**	1.0582	**27.439**	0.97006	**26.048**
74	1.4535	**28.560**	1.2961	**30.020**	1.1625	**30.352**	1.0501	**29.706**	0.95649	**28.187**
75	1.4732	**31.099**	1.3036	**32.564**	1.1608	**32.858**	1.0413	**32.134**	0.94202	**30.489**
76	1.4934	**33.811**	1.3109	**35.274**	1.1587	**35.531**	1.0318	**34.730**	0.92671	**32.966**
77	1.5140	**36.702**	1.3181	**38.156**	1.1561	**38.374**	1.0218	**37.505**	0.91068	**35.633**
78	1.5348	**39.778**	1.3251	**41.212**	1.1531	**41.392**	1.0113	**40.467**	0.89405	**38.501**
79	1.5559	**43.043**	1.3318	**44.446**	1.1498	**44.590**	1.0004	**43.620**	0.87701	**41.582**
80	1.5768	**46.501**	1.3383	**47.859**	1.1462	**47.968**	0.98931	**46.968**	0.85979	**44.887**
81	1.5974	**50.151**	1.3444	**51.449**	1.1425	**51.527**	0.97822	**50.517**	0.84264	**48.427**
82	1.6174	**53.989**	1.3500	**55.212**	1.1387	**55.264**	0.96733	**54.267**	0.82584	**52.209**
83	1.6364	**58.011**	1.3552	**59.140**	1.1349	**59.171**	0.95686	**58.212**	0.80977	**56.233**
84	1.6541	**62.210**	1.3599	**63.223**	1.1312	**63.237**	0.94710	**62.344**	0.79476	**60.499**
85	1.6700	**66.570**	1.3640	**67.449**	1.1279	**67.450**	0.93826	**66.650**	0.78120	**64.994**
86	1.6837	**71.070**	1.3674	**71.800**	1.1250	**71.793**	0.93061	**71.113**	0.76946	**69.703**
87	1.6949	**75.690**	1.3702	**76.254**	1.1225	**76.245**	0.92439	**75.710**	0.75991	**74.598**
88	1.7031	**80.406**	1.3722	**80.790**	1.1207	**80.781**	0.91979	**80.413**	0.75283	**79.645**
89	1.7081	**85.187**	1.3734	**85.381**	1.1196	**85.376**	0.91696	**85.188**	0.74849	**84.796**
90	1.7099	**90.000**	1.3738	**90.000**	1.1192	**90.000**	0.91601	**90.000**	0.74702	**90.000**

Note. Negative quantities are in heavy type.

Examples. tanh (2.1 $\underline{/48°}$) = 1.1280 $\underline{/0°.141}$ = 1.1280 $\underline{/0°.08'.28''}$.

tanh (2.1 $\underline{/49°}$) = 1.1357 $\overline{\backslash 0°.206}$ = 1.1357 $\overline{\backslash 0°\ 12'.22''}$.

$\tanh^{-1}$ (1.0318 $\overline{\backslash 34°.730}$) = 2.4 $\underline{/76°}$.

TABLE III. HYPERBOLIC TANGENTS. tanh $(\rho \underline{/\delta}) = r \underline{/\gamma}$. CONTINUED

°	2.6	°	2.7	°	2.8	°	2.9	°	3.0	°
45	1.0445	1.480	1.0348	1.576	1.0264	1.595	1.0192	1.554	1.0131	1.468
46	1.0456	1.744	1.0352	1.821	1.0262	1.816	1.0185	1.748	1.0120	1.637
47	1.0465	2.030	1.0354	2.083	1.0257	2.051	1.0175	1.955	1.0107	1.815
48	1.0473	2.337	1.0353	2.365	1.0250	2.303	1.0163	2.175	1.0091	2.002
49	1.0479	2.667	1.0350	2.666	1.0240	2.572	1.0148	2.409	1.0072	2.198
50	1.0483	3.022	1.0344	2.988	1.0227	2.857	1.0129	2.656	1.0049	2.405
51	1.0483	3.403	1.0335	3.332	1.0210	3.160	1.0106	2.916	1.0023	2.622
52	1.0480	3.812	1.0323	3.700	1.0189	3.483	1.0080	3.191	0.99922	2.849
53	1.0475	4.250	1.0307	4.094	1.0164	3.826	1.0049	3.481	0.99572	3.086
54	1.0466	4.717	1.0286	4.513	1.0135	4.190	1.0013	3.788	0.99174	3.334
55	1.0452	5.219	1.0260	4.959	1.0101	4.577	0.99722	4.112	0.98722	3.593
56	1.0434	5.756	1.0230	5.437	1.0061	4.987	0.99254	4.452	0.98211	3.862
57	1.0412	6.331	1.0194	5.945	1.0015	5.422	0.98724	4.810	0.97637	4.141
58	1.0385	6.947	1.0152	6.487	0.99625	5.884	0.98126	5.186	0.96995	4.432
59	1.0351	7.606	1.0104	7.066	0.99027	6.374	0.97454	5.582	0.96279	4.735
60	1.0311	8.313	1.0048	7.684	0.98353	6.895	0.96701	5.999	0.95481	5.049
61	1.0265	9.069	0.99847	8.343	0.97597	7.449	0.95862	6.439	0.94597	5.375
62	1.0211	9.879	0.99129	9.048	0.96751	8.036	0.94930	6.904	0.93619	5.713
63	1.0149	10.747	0.98322	9.801	0.95807	8.660	0.93897	7.392	0.92540	6.063
64	1.0079	11.677	0.97420	10.607	0.94760	9.325	0.92756	7.907	0.91352	6.426
65	0.99990	12.675	0.96414	11.470	0.93603	10.033	0.91500	8.452	0.90047	6.801
66	0.99099	13.747	0.95300	12.393	0.92328	10.789	0.90121	9.027	0.88618	7.192
67	0.98106	14.898	0.94070	13.383	0.90927	11.599	0.88612	9.639	0.87055	7.598
68	0.97006	16.136	0.92720	14.449	0.89396	12.464	0.86964	10.289	0.85350	8.021
69	0.95794	17.469	0.91243	15.597	0.87726	13.396	0.85169	10.982	0.83495	8.463
70	0.94467	18.902	0.89635	16.833	0.85912	14.399	0.83221	11.722	0.81482	8.926
71	0.93022	20.451	0.87893	18.168	0.83950	15.482	0.81113	12.518	0.79302	9.414
72	0.91458	22.122	0.86013	19.613	0.81834	16.655	0.78839	13.378	0.76946	9.932
73	0.89775	23.929	0.83994	21.184	0.79562	17.931	0.76394	14.310	0.74408	10.485
74	0.87976	25.884	0.81839	22.893	0.77134	19.325	0.73774	15.328	0.71683	11.081
75	0.86066	28.003	0.79552	24.757	0.74551	20.857	0.70977	16.448	0.68765	11.729
76	0.84053	30.302	0.77140	26.799	0.71815	22.547	0.68005	17.690	0.65650	12.443
77	0.81949	32.799	0.74612	29.038	0.68938	24.421	0.64861	19.078	0.62338	13.241
78	0.79769	35.513	0.71985	31.505	0.65930	26.512	0.61551	20.647	0.58829	14.146
79	0.77535	38.466	0.69278	34.231	0.62807	28.861	0.58087	22.437	0.55129	15.191
80	0.75271	41.678	0.66520	37.249	0.59596	31.519	0.54486	24.504	0.51245	16.419
81	0.73010	45.171	0.63743	40.599	0.56326	34.543	0.50773	26.921	0.47190	17.893
82	0.70790	48.966	0.60990	44.322	0.53039	38.004	0.46981	29.784	0.42986	19.700
83	0.68652	53.078	0.58311	48.464	0.49791	41.989	0.43156	33.221	0.38661	21.976
84	0.66645	57.517	0.55765	53.060	0.46648	46.591	0.39363	37.403	0.34257	24.916
85	0.64820	62.286	0.53421	58.143	0.43691	51.907	0.35689	42.549	0.29833	28.839
86	0.63230	67.370	0.51353	63.722	0.41024	58.025	0.32255	48.931	0.25491	34.254
87	0.61928	72.740	0.49636	69.778	0.38762	64.988	0.29220	56.833	0.21393	41.990
88	0.60959	78.349	0.48347	76.253	0.37028	72.762	0.26791	66.456	0.17815	53.294
89	0.60361	84.129	0.47544	83.042	0.35929	81.195	0.25198	77.709	0.15225	69.480
90	0.60160	90.000	0.47273	90.000	0.35553	90.000	0.24641	90.000	0.14255	90.000

Note. Negative quantites are in heavy type.

Examples tanh $(2.6 \underline{/65^\circ}) = 0.99990 \underline{/12^\circ.675} = 0.99990 \underline{/12^\circ.40'.30''}$.

$\tanh^{-1} (0.88618 \overline{\backslash 7^\circ.192}) = 3.0 \underline{/66^\circ}$.

Table IV. CORRECTING FACTOR. $\frac{\sinh\theta}{\theta} = r \underline{/\gamma}$

	0.1		0.2		0.3		0.4		0.5	
°		°		°		°		°		°
45	1.00000	0.096	1.00000	0.383	1.00000	0.860	1.00013	1.532	1.00032	2.391
46	0.99993	0.095	0.99975	0.382	0.99950	0.858	0.99920	1.529	0.99888	2.388
47	0.99987	0.095	0.99950	0.381	0.99897	0.856	0.99828	1.526	0.99744	2.385
48	0.99981	0.094	0.99930	0.380	0.99847	0.854	0.99733	1.520	0.99598	2.378
49	0.99975	0.094	0.99910	0.378	0.99797	0.852	0.99640	1.513	0.99454	2.368
50	0.99970	0.094	0.99880	0.376	0.99743	0.848	0.99550	1.506	0.99312	2.357
51	0.99965	0.093	0.99860	0.374	0.99690	0.842	0.99460	1.497	0.99170	2.342
52	0.99960	0.092	0.99840	0.371	0.99640	0.834	0.99370	1.486	0.99028	2.325
53	0.99955	0.091	0.99815	0.367	0.99590	0.826	0.99280	1.472	0.98888	2.304
54	0.99950	0.090	0.99795	0.362	0.99540	0.818	0.99190	1.458	0.98748	2.281
55	0.99944	0.089	0.99775	0.357	0.99490	0.809	0.99103	1.440	0.98610	2.254
56	0.99939	0.088	0.99755	0.352	0.99443	0.799	0.99018	1.421	0.98476	2.226
57	0.99933	0.086	0.99730	0.347	0.99397	0.787	0.98930	1.400	0.98344	2.195
58	0.99928	0.085	0.99705	0.342	0.99347	0.773	0.98845	1.378	0.98212	2.160
59	0.99922	0.083	0.99685	0.336	0.99300	0.760	0.98763	1.354	0.98082	2.123
60	0.99917	0.082	0.99670	0.331	0.99257	0.746	0.98685	1.330	0.97956	2.085
61	0.99912	0.081	0.99645	0.324	0.99213	0.731	0.98603	1.302	0.97832	2.042
62	0.99907	0.079	0.99625	0.317	0.99170	0.715	0.98523	1.273	0.97710	1.998
63	0.99902	0.077	0.99605	0.309	0.99127	0.698	0.98448	1.243	0.97590	1.950
64	0.99897	0.075	0.99585	0.301	0.99083	0.680	0.98373	1.212	0.97476	1.900
65	0.99893	0.073	0.99570	0.293	0.99040	0.661	0.98300	1.179	0.97364	1.848
66	0.99889	0.071	0.99555	0.284	0.99000	0.641	0.98232	1.144	0.97254	1.794
67	0.99885	0.069	0.99540	0.275	0.98963	0.621	0.98165	1.108	0.97150	1.738
68	0.99881	0.066	0.99520	0.265	0.98927	0.599	0.98100	1.070	0.97046	1.679
69	0.99877	0.064	0.99505	0.255	0.98891	0.577	0.98035	1.030	0.96946	1.617
70	0.99873	0.062	0.99490	0.245	0.98857	0.555	0.97975	0.990	0.96852	1.554
71	0.99869	0.059	0.99475	0.235	0.98823	0.532	0.97918	0.948	0.96760	1.489
72	0.99865	0.057	0.99460	0.225	0.98790	0.508	0.97863	0.905	0.96676	1.422
73	0.99861	0.054	0.99445	0.214	0.98760	0.483	0.97808	0.861	0.96592	1.354
74	0.99858	0.051	0.99435	0.203	0.98733	0.458	0.97758	0.817	0.96514	1.284
75	0.99855	0.048	0.99425	0.192	0.98707	0.432	0.97710	0.771	0.96440	1.212
76	0.99852	0.045	0.99415	0.180	0.98680	0.406	0.97665	0.724	0.96368	1.138
77	0.99850	0.042	0.99405	0.168	0.98653	0.379	0.97625	0.676	0.96304	1.062
78	0.99847	0.039	0.99395	0.156	0.98633	0.351	0.97585	0.628	0.96246	0.986
79	0.99845	0.036	0.99385	0.144	0.98613	0.322	0.97545	0.578	0.96190	0.909
80	0.99843	0.033	0.99375	0.131	0.98593	0.294	0.97512	0.528	0.96134	0.830
81	0.99841	0.030	0.99365	0.118	0.98577	0.266	0.97483	0.477	0.96088	0.750
82	0.99839	0.026	0.99360	0.106	0.98563	0.238	0.97458	0.425	0.96046	0.669
83	0.99838	0.023	0.99355	0.093	0.98553	0.209	0.97433	0.373	0.96008	0.587
84	0.99837	0.020	0.99350	0.080	0.98543	0.180	0.97413	0.321	0.95974	0.505
85	0.99836	0.017	0.99345	0.067	0.98537	0.150	0.97395	0.268	0.95944	0.422
86	0.99835	0.014	0.99340	0.054	0.98530	0.120	0.97380	0.215	0.95920	0.338
87	0.99834	0.011	0.99335	0.041	0.98523	0.090	0.97370	0.162	0.95904	0.254
88	0.99833	0.008	0.99335	0.028	0.98517	0.060	0.97365	0.108	0.95894	0.170
89	0.99832	0.004	0.99335	0.014	0.98510	0.030	0.97360	0.054	0.95890	0.085
90	0.99831	0.000	0.99335	0.000	0.98507	0.000	0.97355	0.000	0.95886	0.000

Note. $\frac{\sinh\theta}{\theta} = 1.0$ when $\theta = 0 \underline{/\delta}.$

Example. $\frac{\sinh(0.3 \underline{/69^\circ})}{0.3 \underline{/69^\circ}} = 0.98891 \underline{/0^\circ.577} = 0.98891 \underline{/0^\circ.34'.37''}.$

TABLE IV. CORRECTING FACTOR. $\frac{\sinh\theta}{\theta} = r\,\underline{/\gamma}$. CONTINUED

°	0.6	°	0.7	°	0.8	°	0.9	°	1.0	°
45	1.00070	3.440	1.00134	4.676	1.00230	6.108	1.00363	7.728	1.00553	9.531
46	0.99863	3.437	0.99849	4.679	0.99856	6.112	0.99893	7.735	0.99975	9.546
47	0.99655	3.434	0.99564	4.676	0.99484	6.109	0.99425	7.734	0.99394	9.550
48	0.99445	3 426	0.99281	4 666	0.99114	6.099	0.98955	7.725	0.98816	9.543
49	0.99237	3.414	0.98999	4.652	0.98745	6.082	0.98488	7.707	0.98242	9.525
50	0.99030	3.398	0.98717	4.632	0.98379	6.058	0.98026	7.679	0.97672	9.495
51	0.98825	3.379	0.98439	4.606	0.98015	6.026	0.97567	7.642	0.97105	9.453
52	0.98623	3.355	0.98161	4.574	0.97655	5.987	0.97111	7.595	0.96543	9.399
53	0.98421	3.326	0.97887	4.537	0.97298	5.940	0.96659	7.538	0.95986	9.333
54	0.98220	3.293	0.97616	4.493	0.96944	5.886	0.96211	7.472	0.95435	9.255
55	0.98023	3.256	0.97349	4.445	0.96594	5.824	0.95769	7.396	0.94890	9.166
56	0.97830	3.215	0.97084	4.391	0.96249	5.755	0.95333	7.312	0.94353	9.065
57	0.97638	3.171	0.96823	4.331	0.95909	5.678	0.94904	7.218	0.93825	8.952
58	0.97448	3.122	0.96564	4.265	0.95574	5.593	0.94482	7.114	0.93305	8.827
59	0.97262	3.069	0.96313	4.193	0.95244	5.502	0.94067	7.000	0.92795	8.691
60	0.97081	3.013	0.96067	4.117	0.94923	5.405	0.93661	6.878	0.92295	8.544
61	0.96903	2.953	0.95826	4.036	0.94608	5.300	0.93263	6.747	0.91805	8.385
62	0.96728	2.889	0.95589	3.951	0.94299	5.189	0.92874	6.607	0.91325	8.215
63	0.96557	2.821	0.95356	3.859	0.93996	5.070	0.92493	6.458	0.90856	8.033
64	0.96390	2.749	0.95130	3.762	0.93703	4.944	0.92121	6.300	0.90400	7.841
65	0.96228	2.674	0.94911	3.661	0.93416	4.812	0.91761	6.136	0.89957	7.637
66	0.96072	2.596	0.94697	3.554	0.93140	4.674	0.91411	5.962	0.89527	7.424
67	0.95922	2.515	0.94493	3.444	0.92873	4.529	0.91074	5.780	0.89111	7.201
68	0.95775	2.430	0.94293	3.329	0.92614	4.379	0.90747	5.590	0.88708	6.968
69	0.95632	2.342	0.94100	3.209	0.92364	4.223	0.90430	5.392	0.88320	6.723
70	0.95495	2.251	0.93914	3.085	0.92123	4.061	0.90127	5.187	0.87947	6.469
71	0.95365	2.157	0.93737	2.957	0.91891	3.894	0.89837	4.975	0.87589	6.207
72	0.95242	2.061	0.93569	2.825	0.91671	3.722	0.89558	4.756	0.87247	5.936
73	0.95123	1.962	0.93407	2.689	0.91461	3.544	0.89292	4.530	0.86921	5.656
74	0.95010	1.860	0.93254	2.550	0.91261	3.361	0.89041	4.298	0.86612	5.368
75	0.94902	1.756	0.93109	2.408	0.91073	3.174	0.88804	4.059	0.86320	5.072
76	0.94802	1.649	0.92973	2.263	0.90895	2.982	0.88581	3.815	0.86045	4.769
77	0.94707	1.540	0.92846	2.114	0.90729	2.787	0.88372	3.566	0.85788	4.458
78	0.94620	1.429	0.92727	1.962	0.90574	2.588	0.88177	3.312	0.85549	4.141
79	0.94540	1.317	0.92617	1.808	0.90431	2.385	0.87997	3.053	0.85328	3:818
80	0.94465	1.203	0.92516	1.652	0.90301	2.179	0.87831	2.789	0.85125	3.489
81	0.94397	1.087	0.92424	1.493	0.90183	1.969	0.87681	2.522	0.84940	3.156
82	0.94337	0.970	0.92343	1.332	0.90076	1.757	0.87547	2.251	0.84774	2.817
83	0.94283	0.852	0.92270	1.169	0.89981	1.543	0.87428	1.976	0.84628	2.474
84	0.94237	0.732	0.92207	1.005	0.89899	1.327	0.87324	1.699	0.84501	2.128
85	0.94197	0.612	0.92153	0.839	0.89829	1.109	0.87237	1.420	0.84393	1.779
86	0.94163	0.490	0.92109	0.673	0.89771	0.889	0.87164	1.138	0.84305	1.426
87	0.94138	0.368	0.92074	0.506	0.89726	0.668	0.87108	0.855	0.84236	1.071
88	0.94122	0.246	0.92050	0.338	0.89694	0.446	0.87068	0.571	0.84186	0.715
89	0.94110	0.123	0.92036	0.169	0.89675	0.223	0.87043	0.286	0.84156	0.358
90	0.94107	0.000	0.92031	0.000	0.89670	0.000	0.87037	0.000	0.84147	0.000

Example. $\frac{\sinh(1.0\,\underline{/85^\circ})}{1.0\,\underline{/85^\circ}} = 0.84393\,\underline{/1^\circ.779} = 0.84393\,\underline{/1^\circ.46'.44''}$.

Table IV. CORRECTING FACTOR. $\frac{\sinh \theta}{\theta} = r \underline{/\gamma}$. Continued

	1.1		1.2		1.3		1.4		1.5	
°		°		°		°		°		°
45	1.0081	11.519	1.0115	13.692	1.0158	16.034	1.0212	18.568	1.0279	21.262
46	1.0011	11.543	1.0031	13.726	1.0060	16.092	1.0099	18.639	1.0148	21.355
47	0.99409	11.555	0.99475	13.748	0.99623	16.128	0.99850	18.689	1.0018	21.426
48	0.98709	11.553	0.98650	13.753	0.98654	16.142	0.98729	18.717	0.98893	21.474
49	0.98018	11.536	0.97825	13.741	0.97685	16.137	0.97607	18.723	0.97613	21.496
50	0.97327	11.506	0.97008	13.712	0.96722	16.113	0.96493	18.707	0.96340	21.492
51	0.96636	11.461	0.96192	13.666	0.95770	16.068	0.95393	18.668	0.95080	21.462
52	0.95964	11.401	0.95383	13.603	0.94822	16.004	0.94300	18.605	0.93833	21.405
53	0.95291	11.327	0.94583	13.523	0.93892	15.919	0.93221	18.519	0.92593	21.321
54	0.94627	11.239	0.93800	13.425	0.92969	15.814	0.92157	18.409	0.91373	21.210
55	0.93963	11.136	0.93017	13.310	0.92054	15.688	0.91100	18.275	0.90167	21.072
56	0.93318	11.019	0.92250	13.178	0.91154	15.542	0.90064	18.117	0.88980	20.907
57	0.92682	10.888	0.91492	13.028	0.90269	15.376	0.89043	17.936	0.87813	20.713
58	0.92054	10.742	0.90750	12.860	0.89400	15.188	0.88036	17.730	0.86667	20.491
59	0.91436	10.581	0.90017	12.675	0.88546	14.980	0.87050	17.500	0.85540	20.240
60	0.90836	10.406	0.89300	12.474	0.87715	14.752	0.86086	17.246	0.84433	19.964
61	0.90244	10.218	0.88600	12.255	0.86892	14.502	0.85136	16.967	0.83353	19.657
62	0.89666	10.016	0.87918	12.019	0.86092	14.232	0.84214	16.663	0.82300	19.321
63	0.89103	9.800	0.87250	11.767	0.85315	13.942	0.83314	16.335	0.81273	18.956
64	0.88554	9.570	0.86600	11.497	0.84554	13.632	0.82436	15.983	0.80267	18.562
65	0.88019	9.327	0.85967	11.211	0.83808	13.301	0.81579	15.607	0.79293	18.140
66	0.87501	9.071	0.85350	10.909	0.83094	12.950	0.80750	15.207	0.78347	17.690
67	0.86998	8.801	0.84758	10.594	0.82400	12.580	0.79950	14.783	0.77433	17.211
68	0.86514	8.519	0.84183	10.257	0.81731	12.191	0.79171	14.335	0.86547	16.704
69	0.86045	8.225	0.83625	9.907	0.81077	11.783	0.78421	13.865	0.75693	16.169
70	0.85596	7.918	0.83093	9.543	0.80454	11.357	0.77707	13.373	0.74873	15.607
71	0.85165	7.600	0.82583	9.164	0.79862	10.912	0.77021	12.858	0.74087	15.018
72	0.84754	7.271	0.82095	8.771	0.79292	10.450	0.76364	12.322	0.73333	14.402
73	0.84362	6.931	0.81631	8.365	0.78746	9.971	0.75736	11.765	0.72620	13.761
74	0.83989	6.580	0.81190	7.946	0.78231	9.476	0.75143	11.188	0.71940	13.096
75	0.83637	6.220	0.80773	7.514	0.77746	8.966	0.74579	10.591	0.71293	12.406
76	0.83306	5.850	0.80380	7.069	0.77287	8.440	0.74050	9.975	0.70687	11.693
77	0.82996	5.471	0.80013	6.614	0.76858	7.900	0.73557	9.342	0.70120	10.958
78	0.82707	5.084	0.79671	6.148	0.76459	7.346	0.73093	8.692	0.69593	10.201
79	0.82441	4.689	0.79355	5.672	0.76090	6.780	0.72664	8.026	0.69107	9.425
80	0.82196	4.286	0.79065	5.187	0.75751	6.202	0.72279	7.346	0.68660	8.630
81	0.81975	3.877	0.78802	4.693	0.75444	5.614	0.71921	6.651	0.68253	7.818
82	0.81775	3.462	0.78566	4.191	0.75165	5.016	0.71600	5.944	0.67887	6.991
83	0.81599	3.041	0.78358	3.683	0.74923	4.408	0.71319	5.227	0.67567	6.149
84	0.81445	2.616	0.78175	3.169	0.74711	3.793	0.71073	4.499	0.67287	5.294
85	0.81315	2.186	0.78022	2.649	0.74531	3.171	0.70864	3.762	0.67047	4.429
86	0.81209	1.753	0.77895	2.124	0.74383	2.544	0.70694	3.018	0.66847	3.554
87	0.81125	1.317	0.77797	1.596	0.74268	1.912	0.70561	2.269	0.66693	2.673
88	0.81066	0.879	0.77727	1.065	0.74185	1.277	0.70466	1.515	0.66587	1.785
89	0.81031	0.440	0.77684	0.533	0.74136	0.639	0.70409	0.758	0.66521	0.893
90	0.81019	0.000	0.77670	0.000	0.74120	0.000	0.70389	0.000	0.66499	0.000

Example. $\frac{\sinh (1.5 \underline{/65^\circ})}{1.5 \underline{/65^\circ}} = 0.79293 \underline{/18^\circ.140} = 0.79293 \underline{/18^\circ.08'.24''}.$

Table IV. CORRECTING FACTOR. $\frac{\sinh\theta}{\theta} = r\,\underline{/\gamma}.$ Continued

°	1.6	°	1.7	°	1.8	°	1.9	°	2.0	°
45	1.0359	24.117	1.0456	27.133	1.0572	30.292	1.0707	33.590	1.0863	37.016
46	1.0211	24.241	1.0290	27.288	1.0385	30.486	1.0499	33.829	1.0633	37.304
47	1.0064	24.339	1.0124	27.418	1.0199	30.651	1.0292	34.037	1.0405	37.560
48	0.99175	24.409	0.99582	27.515	1.0015	30.784	1.0087	34.210	1.0178	37.778
49	0.97719	24.451	0.97947	27.582	0.98317	30.883	0.98837	34.346	0.99535	37.958
50	0.96275	24.465	0.96323	27.618	0.96500	30.946	0.96821	34.444	0.97310	38.098
51	0.94844	24.449	0.94718	27.620	0.94700	30.974	0.94821	34.503	0.95110	38.196
52	0.93431	24.402	0.93123	27.590	0.92922	30.966	0.92858	34.524	0.92940	38.253
53	0.92031	24.325	0.91547	27.527	0.91167	30.921	0.90911	34.505	0.90800	38.267
54	0.90650	24.218	0.89994	27.429	0.89433	30.839	0.88995	34.444	0.88685	38.236
55	0.89281	24.079	0.88465	27.296	0.87728	30.718	0.87106	34.342	0.86600	38.160
56	0.87938	23.910	0.86953	27.128	0.86044	30.558	0.85242	34.197	0.84555	38.039
57	0.86619	23.709	0.85471	26.924	0.84389	30.358	0.83411	34.008	0.82545	37.869
58	0.85319	23.475	0.84012	26.683	0.82767	30.116	0.81611	33.773	0.80570	37.650
59	0.84044	23.209	0.82582	26.406	0.81172	29.834	0.79847	33.493	0.78630	37.382
60	0.82794	22.910	0.81176	26.091	0.79611	29.510	0.78121	33.167	0.76735	37.062
61	0.81569	22.578	0.79806	25.738	0.78083	29.142	0.76437	32.792	0.74880	36.688
62	0.80375	22.212	0.78464	25.347	0.76594	28.730	0.74795	32.368	0.73070	36.261
63	0.79213	21.813	0.77159	24.917	0.75139	28.274	0.73179	31.893	0.71300	35.778
64	0.78075	21.380	0.75888	24.447	0.73722	27.774	0.71611	31.368	0.69575	35.238
65	0.76975	20.913	0.74647	23.938	0.72344	27.228	0.70084	30.792	0.67900	34.639
66	0.75906	20.413	0.73447	23.390	0.71006	26.636	0.68605	30.162	0.66275	33.980
67	0.74869	19.879	0.72282	22.802	0.69711	25.997	0.67168	29.478	0.64700	33.261
68	0.73869	19.311	0.71159	22.175	0.68455	25.312	0.65779	28.741	0.63175	32.479
69	0.72900	18.710	0.70076	21.508	0.67244	24.580	0.64421	27.949	0.61700	31.634
70	0.71975	18.076	0.69035	20.801	0.66083	23.802	0.63153	27.102	0.60280	30.725
71	0.71081	17.410	0.68035	20.055	0.64967	22.976	0.61916	26.199	0.58915	29.750
72	0.70231	16.712	0.67076	19.271	0.63900	22.104	0.60731	25.241	0.57605	28.709
73	0.69419	15.982	0.66165	18.448	0.62878	21.187	0.59600	24.227	0.56355	27.602
74	0.68650	15.221	0.65300	17.588	0.61911	20.224	0.58526	23.158	0.55165	26.428
75	0.67919	14.431	0.64476	16.692	0.60994	19.215	0.57500	22.034	0.54035	25.187
76	0.67231	13.613	0.63700	15.760	0.60128	18.162	0.56542	20.856	0.52970	23.880
77	0.66588	12.767	0.62976	14.794	0.59317	17.068	0.55637	19.625	0.51970	22.507
78	0.65988	11.894	0.62300	13.795	0.58561	15.933	0.54795	18.343	0.51035	21.070
79	0.65431	10.997	0.61676	12.765	0.57861	14.758	0.54011	17.012	0.50165	19.571
80	0.64925	10.076	0.61106	11.705	0.57217	13.545	0.53295	15.633	0.49364	18.011
81	0.64463	9.134	0.60582	10.618	0.56633	12.298	0.52642	14.209	0.48636	16.391
82	0.64050	8.171	0.60112	9.505	0.56106	11.019	0.52052	12.744	0.47979	14.722
83	0.63681	7.191	0.59700	8.370	0.55639	9.711	0.51530	11.240	0.47396	13.000
84	0.63363	6.194	0.59341	7.214	0.55234	8.374	0.51075	9.702	0.46888	11.233
85	0.63094	5.184	0.59035	6.039	0.54890	7.015	0.50689	8.133	0.46455	9.426
86	0.62875	4.161	0.58782	4.850	0.54607	5.636	0.50372	6.539	0.46101	7.584
87	0.62700	3.129	0.58586	3.649	0.54387	4.241	0.50124	4.923	0.45823	5.713
88	0.62575	2.090	0.58445	2.438	0.54229	2.834	0.49947	3.291	0.45624	3.821
89	0.62500	1.046	0.58361	1.230	0.54135	1.419	0.49841	1.648	0.45505	1.914
90	0.62473	0.000	0.58333	0.000	0.54103	0.000	0.49805	0.000	0.45465	0.000

Example. $\frac{\sinh(1.8\,\underline{/77^\circ})}{1.8\,\underline{/77^\circ}} = 0.59317\,\underline{/17^\circ.068} = 0.59317\,\underline{/17^\circ.4'.05''}.$

TABLE IV. CORRECTING FACTOR. $\frac{\sinh \theta}{\theta} = r \underline{/\gamma}$. CONTINUED

°	2.1	°	2.2	°	2.3	°	2.4	°	2.5	°
45	1.1043	40.558	1.1248	44.205	1.1480	47.946	1.1740	51.769	1.2032	55.661
46	1.0789	40.905	1.0970	44.613	1.1177	48.419	1.1411	52.312	1.1674	56.278
47	1.0538	41.213	1.0695	44.981	1.0877	48.851	1.1085	52.813	1.1320	56.852
48	1.0289	41.482	1.0423	45.307	1.0580	49.241	1.0762	53.271	1.0972	57.383
49	1.0043	41.711	1.0153	45.592	1.0286	49.588	1.0444	53.685	1.0627	57.869
50	0.97986	41.898	0.98864	45.834	0.99965	49.890	1.0130	54.053	1.0288	58.309
51	0.95576	42.042	0.96232	46.031	0.97104	50.146	0.98200	54.375	0.99540	58.701
52	0.93195	42.142	0.93636	46.181	0.94283	50.354	0.95150	54.648	0.96256	59.044
53	0.90848	42.197	0.91077	46.284	0.91504	50.514	0.92154	54.871	0.93028	59.337
54	0.88533	42.205	0.88559	46.338	0.88774	50.623	0.89208	55.042	0.89860	59.578
55	0.86257	42.165	0.86082	46.342	0.86091	50.680	0.86308	55.160	0.86748	59.765
56	0.84019	42.076	0.83646	46.294	0.83457	50.683	0.83467	55.223	0.83700	59.896
57	0.81819	41.935	0.81255	46.193	0.80869	50.629	0.80683	55.228	0.80712	59.970
58	0.79662	41.742	0.78909	46.035	0.78331	50.518	0.77954	55.174	0.77788	59.984
59	0.77543	41.494	0.76609	45.820	0.75848	50.347	0.75283	55.059	0.74932	59.936
60	0.75471	41.191	0.74359	45.546	0.73417	50.114	0.72671	54.880	0.72140	59.823
61	0.73447	40.830	0.72159	45.210	0.71043	49.816	0.70121	54.634	0.69412	59.642
62	0.71467	40.410	0.70009	44.811	0.68725	49.451	0.67633	54.319	0.66752	59.391
63	0.69538	39.929	0.67914	44.345	0.66465	49.016	0.65204	53.931	0.64160	59.067
64	0.67657	39.386	0.65873	43.811	0.64261	48.509	0.62838	53.467	0.61636	58.665
65	0.65829	38.777	0.63886	43.207	0.62113	47.926	0.60533	52.924	0.59176	58.182
66	0.64053	38.101	0.61955	42.529	0.60026	47.264	0.58296	52.297	0.56784	57.613
67	0.62329	37.357	0.60082	41.775	0.58004	46.519	0.56121	51.583	0.54464	56.954
68	0.60657	36.542	0.58268	40.943	0.56043	45.688	0.54013	50.777	0.52208	56.198
69	0.59043	35.655	0.56514	40.029	0.54143	44.767	0.51971	49.874	0.50024	55.341
70	0.57487	34.694	0.54818	39.030	0.52309	43.752	0.49996	48.868	0.47908	54.376
71	0.55990	33.656	0.53186	37.944	0.50539	42.638	0.48088	47.754	0.45864	53.296
72	0.54557	32.541	0.51618	36.769	0.48835	41.422	0.46246	46.526	0.43888	52.092
73	0.53181	31.348	0.50118	35.501	0.47204	40.100	0.44479	45.177	0.41988	50.755
74	0.51871	30.074	0.48682	34.138	0.45644	38.667	0.42783	43.701	0.40160	49.277
75	0.50629	28.719	0.47323	32.678	0.44152	37.118	0.41165	42.091	0.38408	47.648
76	0.49453	27.283	0.46027	31.119	0.42736	35.449	0.39621	40.341	0.36732	45.857
77	0.48347	25.766	0.44810	29.459	0.41397	33.659	0.38157	38.443	0.35137	43.891
78	0.47311	24.168	0.43666	27.699	0.40135	31.744	0.36775	36.390	0.33625	41.740
79	0.46349	22.491	0.42601	25.839	0.38963	29.701	0.35480	34.178	0.32201	39.392
80	0.45461	20.736	0.41617	23.879	0.37873	27.531	0.34273	31.803	0.30869	36.836
81	0.44650	18.907	0.40716	21.822	0.36873	25.233	0.33162	29.261	0.29633	34.063
82	0.43919	17.008	0.39902	19.671	0.35965	22.810	0.32149	26.550	0.28500	31.065
83	0.43268	15.043	0.39176	17.432	0.35153	20.267	0.31239	23.676	0.27477	27.841
84	0.42699	13.015	0.38540	15.111	0.34441	17.611	0.30438	20.643	0.26569	24.390
85	0.42215	10.933	0.37998	12.715	0.33831	14.851	0.29748	17.462	0.25784	20.723
86	0.41818	8.806	0.37551	10.254	0.33328	12.000	0.29178	14.147	0.25131	16.855
87	0.41507	6.639	0.37202	7.740	0.32933	9.071	0.28728	10.717	0.24614	12.811
88	0.41284	4.443	0.36951	5.183	0.32650	6.082	0.28405	7.197	0.24241	8.624
89	0.41150	2.226	0.36800	2.599	0.32479	3.051	0.28210	3.615	0.24014	4.338
90	0.41105	0.000	0.36750	0.000	0.32422	0.000	0.28144	0.000	0.23939	0.000

Example. $\frac{\sinh (2.3 \underline{/84^\circ})}{2.3 \underline{/84^\circ}} = 0.34441 \underline{/17^\circ.611} = 0.34441 \underline{/17^\circ.36'.40''}.$

Table IV. CORRECTING FACTOR. $\frac{\sinh \theta}{\theta} = r \underline{/\gamma}$. Continued

	2.6		2.7		2.8		2.9		3.0	
°		°		°		°		°		°
45	1.2354	59.613	1.2710	63.614	1.3102	67.653	1.3530	71.721	1.3995	75.814
46	1.1967	60.307	1.2293	64.386	1.2652	68.506	1.3046	72.658	1.3475	76.832
47	1.1586	60.957	1.1881	65.116	1.2209	69.317	1.2570	73.551	1.2965	77.808
48	1.1209	61.564	1.1476	65.801	1.1774	70.084	1.2103	74.400	1.2465	78.741
49	1.0838	62.126	1.1077	66.442	1.1345	70.806	1.1644	75.205	1.1974	79.630
50	1.0473	62.641	1.0685	67.037	1.0925	71.483	1.1195	75.965	1.1494	80.474
51	1.0113	63.109	1.0300	67.585	1.0513	72.113	1.0755	76.679	1.1025	81.272
52	0.97608	63.528	0.99219	68.084	1.0109	72.694	1.0324	77.345	1.0567	82.024
53	0.94145	63.897	0.95514	68.532	0.97143	73.226	0.99038	77.963	1.0120	82.729
54	0.90750	64.214	0.91881	68.929	0.93279	73.708	0.94928	78.532	0.96837	83.386
55	0.87419	64.476	0.88333	69.274	0.89500	74.138	0.90917	79.050	0.92590	83.994
56	0.84162	64.684	0.84863	69.563	0.85811	74.515	0.87007	79.517	0.88453	84.553
57	0.80973	64.834	0.81467	69.797	0.82211	74.837	0.83197	79.932	0.84433	85.062
58	0.77854	64.925	0.78152	69.973	0.78700	75.103	0.79487	80.293	0.80523	85.510
59	0.74808	64.954	0.74919	70.088	0.75275	75.311	0.75876	80.598	0.76727	85.924
60	0.71835	64.918	0.71767	70.140	0.71943	75.459	0.72366	80.847	0.73040	86.276
61	0.68935	64.816	0.68692	70.128	0.68700	75.544	0.68955	81.037	0.69463	86.574
62	0.66104	64.644	0.65700	70.047	0.65543	75.565	0.65641	81.167	0.65993	86.817
63	0.63346	64.399	0.62786	69.895	0.62475	75.519	0.62424	81.235	0.62630	87.004
64	0.60662	64.077	0.59952	69.669	0.59493	75.403	0.59303	81.239	0.59373	87.133
65	0.58054	63.674	0.57193	69.364	0.56596	75.214	0.56272	81.176	0.56217	87.204
66	0.55519	63.185	0.54514	68.978	0.53785	74.948	0.53334	81.044	0.53160	87.214
67	0.53054	62.606	0.51911	68.504	0.51054	74.599	0.50486	80.838	0.50203	87.161
68	0.50658	61.930	0.49386	67.935	0.48404	74.164	0.47724	80.555	0.47340	87.043
69	0.48338	61.151	0.46937	67.266	0.45832	73.634	0.45045	80.190	0.44567	86.858
70	0.46089	60.262	0.44559	66.489	0.43343	73.005	0.42448	79.738	0.41883	86.602
71	0.43911	59.254	0.42256	65.596	0.40928	72.267	0.39934	79.191	0.39283	86.271
72	0.41808	58.117	0.40026	64.576	0.38586	71.411	0.37497	78.541	0.36767	85.860
73	0.39773	56.841	0.37872	63.415	0.36321	70.424	0.35135	77.780	0.34327	85.363
74	0.37814	55.414	0.35789	62.101	0.34125	69.292	0.32845	76.894	0.31964	84.772
75	0.35930	53.822	0.33780	60.617	0.32002	67.996	0.30627	75.867	0.29674	84.077
76	0.34123	52.049	0.31846	58.943	0.29951	66.516	0.28478	74.680	0.27452	83.265
77	0.32395	50.079	0.29987	57.058	0.27971	64.827	0.26397	73.309	0.25296	82.319
78	0.30749	47.893	0.28206	54.935	0.26064	62.897	0.24379	71.721	0.23202	81.216
79	0.29189	45.471	0.26507	52.542	0.24231	60.686	0.22432	69.876	0.21168	79.925
80	0.27718	42.793	0.24894	49.847	0.22476	58.145	0.20551	67.721	0.19191	78.404
81	0.26346	39.837	0.23374	46.812	0.20804	55.217	0.18738	65.183	0.17270	76.592
82	0.25078	36.583	0.21954	43.396	0.19222	51.833	0.16998	62.169	0.15404	74.404
83	0.23922	33.016	0.20644	39.554	0.17741	47.908	0.15343	58.553	0.13596	71.709
84	0.22887	29.126	0.19458	35.252	0.16375	43.351	0.13774	54.168	0.11849	68.313
85	0.21986	24.910	0.18409	30.458	0.15142	38.066	0.12323	48.795	0.10174	63.903
86	0.21227	20.382	0.17515	25.164	0.14069	31.968	0.11016	42.168	0.085917	57.974
87	0.20623	15.571	0.16794	19.390	0.13184	25.015	0.098934	34.005	0.071443	49.701
88	0.20184	10.524	0.16264	13.194	0.12520	17.244	0.090148	24.110	0.059103	37.843
89	0.19917	5.307	0.15938	6.682	0.12105	8.809	0.084469	12.576	0.050307	21.091
90	0.19827	0.000	0.15829	0.000	0.11964	0.000	0.082845	0.000	0.047040	0.000

Example. $\frac{\sinh (3.0 \underline{/86°})}{3.0 \underline{/86°}} = 0.085917 \underline{/57°.974} = 0.085917 \underline{/59°.58'.26''}.$

Table V. CORRECTING FACTOR. $\frac{\tanh\theta}{\theta} = r\,\underline{/\gamma}$

°	0.1	°	0.2	°	0.3	°	0.4	°	0.5	°
45	1.00000	**0.188**	0.99985	**0.765**	0.99937	**1.718**	0.99803	**3.046**	0.99514	**4.750**
46	1.00010	**0.188**	1.00030	**0.764**	1.00040	**1.719**	0.99988	**3.055**	0.99804	**4.771**
47	1.00021	**0.188**	1.00075	**0.763**	1.00143	**1.720**	1.00173	**3.058**	1.00094	**4.781**
48	1.00033	**0.188**	1.00120	**0.761**	1.00250	**1.717**	1.00358	**3.058**	1.00384	**4.787**
49	1.00044	**0.187**	1.00170	**0.758**	1.00357	**1.710**	1.00543	**3.053**	1.00680	**4.787**
50	1.00056	**0.187**	1.00215	**0.755**	1.00460	**1.703**	1.00733	**3.045**	1.00980	**4.780**
51	1.00068	**0.187**	1.00265	**0.749**	1.00563	**1.694**	1.00925	**3.031**	1.01278	**4.767**
52	1.00080	**0.186**	1.00310	**0.744**	1.00670	**1.685**	1.01115	**3.014**	1.01578	**4.747**
53	1.00092	**0.184**	1.00355	**0.738**	1.00773	**1.672**	1.01303	**2.995**	1.01878	**4.724**
54	1.00103	**0.182**	1.00405	**0.732**	1.00877	**1.656**	1.01490	**2.969**	1.02178	**4.692**
55	1.00114	**0.180**	1.00450	**0.724**	1.00980	**1.638**	1.01675	**2.942**	1.02478	**4.656**
56	1.00125	**0.177**	1.00495	**0.715**	1.01083	**1.618**	1.01865	**2.911**	1.02778	**4.612**
57	1.00135	**0.175**	1.00535	**0.705**	1.01183	**1.596**	1.02050	**2.876**	1.03076	**4.561**
58	1.00146	**0.172**	1.00575	**0.694**	1.01283	**1.574**	1.02230	**2.836**	1.03374	**4.506**
59	1.00156	**0.170**	1.00620	**0.682**	1.01380	**1.548**	1.02410	**2.793**	1.03670	**4.444**
60	1.0017	**0.167**	1.0067	**0.668**	1.0148	**1.521**	1.0259	**2.745**	1.0397	**4.375**
61	1.0018	**0.163**	1.0070	**0.655**	1.0158	**1.490**	1.0278	**2.695**	1.0425	**4.300**
62	1.0019	**0.159**	1.0074	**0.640**	1.0167	**1.458**	1.0294	**2.641**	1.0454	**4.220**
63	1.0020	**0.155**	1.0078	**0.625**	1.0176	**1.425**	1.0311	**2.583**	1.0482	**4.133**
64	1.0020	**0.151**	1.0082	**0.609**	1.0185	**1.390**	1.0328	**2.521**	1.0510	**4.041**
65	1.0021	**0.147**	1.0086	**0.592**	1.0193	**1.353**	1.0344	**2.456**	1.0538	**3.942**
66	1.0022	**0.143**	1.0090	**0.575**	1.0202	**1.314**	1.0360	**2.388**	1.0564	**3.836**
67	1.0023	**0.138**	1.0093	**0.557**	1.0210	**1.273**	1.0376	**2.315**	1.0591	**3.724**
68	1.0024	**0.134**	1.0097	**0.539**	1.0218	**1.231**	1.0391	**2.240**	1.0617	**3.609**
69	1.0025	**0.129**	1.0100	**0.520**	1.0226	**1.187**	1.0406	**2.163**	1.0642	**3.489**
70	1.0026	**0.123**	1.0103	**0.499**	1.0234	**1.141**	1.0420	**2.082**	1.0666	**3.362**
71	1.0026	**0.118**	1.0106	**0.478**	1.0241	**1.094**	1.0434	**1.998**	1.0689	**3.229**
72	1.0027	**0.112**	1.0109	**0.456**	1.0247	**1.045**	1.0447	**1.911**	1.0712	**3.091**
73	1.0028	**0.107**	1.0112	**0.434**	1.0254	**0.995**	1.0460	**1.821**	1.0734	**2.948**
74	1.0028	**0.102**	1.0114	**0.411**	1.0260	**0.944**	1.0472	**1.728**	1.0755	**2.800**
75	1.0029	**0.096**	1.0117	**0.388**	1.0266	**0.892**	1.0483	**1.632**	1.0774	**2.649**
76	1.0029	**0.090**	1.0120	**0.365**	1.0272	**0.838**	1.0494	**1.534**	1.0793	**2.493**
77	1.0030	**0.084**	1.0122	**0.341**	1.0277	**0.783**	1.0504	**1.434**	1.0811	**2.333**
78	1.0030	**0.078**	1.0123	**0.316**	1.0282	**0.727**	1.0513	**1.332**	1.0828	**2.169**
79	1.0031	**0.072**	1.0125	**0.291**	1.0287	**0.671**	1.0522	**1.229**	1.0843	**2.001**
80	1.0031	**0.066**	1.0127	**0.266**	1.0291	**0.614**	1.0530	**1.124**	1.0857	**1.830**
81	1.0032	**0.060**	1.0129	**0.241**	1.0295	**0.555**	1.0538	**1.017**	1.0870	**1.656**
82	1.0032	**0.054**	1.0130	**0.215**	1.0298	**0.494**	1.0544	**0.908**	1.0881	**1.480**
83	1.0032	**0.047**	1.0132	**0.188**	1.0301	**0.433**	1.0550	**0.797**	1.0892	**1.301**
84	1.0033	**0.040**	1.0133	**0.162**	1.0304	**0.372**	1.0555	**0.685**	1.0901	**1.119**
85	1.0033	**0.033**	1.0134	**0.136**	1.0307	**0.311**	1.0560	**0.573**	1.0908	**0.935**
86	1.0033	**0.026**	1.0134	**0.109**	1.0309	**0.249**	1.0563	**0.460**	1.0914	**0.749**
87	1.0033	**0.019**	1.0135	**0.082**	1.0310	**0.187**	1.0566	**0.346**	1.0919	**0.562**
88	1.0033	**0.012**	1.0135	**0.054**	1.0311	**0.125**	1.0568	**0.232**	1.0923	**0.374**
89	1.0033	**0.006**	1.0135	**0.027**	1.0311	**0.063**	1.0570	**0.117**	1.0926	**0.187**
90	1.0033	**0.000**	1.0136	**0.000**	1.0311	**0.000**	1.0570	**0.000**	1.0926	**0.000**

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh(0.4\,\underline{/74^\circ})}{0.4\,\underline{/74^\circ}} = 1.0472\,\overline{\backslash 1^\circ.728} = 1.0472\,\overline{\backslash 1^\circ.43'.41''}.$

Table V. CORRECTING FACTOR. $\frac{\tanh\theta}{\theta} = r\,\underline{/\gamma}$. Continued

°	0.6	°	0.7	°	0.8	°	0.9	°	1.0	°
45	0.99010	6.817	0.98189	9.214	0.96971	11.902	0.95284	14.839	0.93077	17.956
46	0.99417	6.854	0.98727	9.281	0.97646	12.020	0.96089	15.020	0.93999	18.216
47	0.99830	6.881	0.99279	9.337	0.98339	12.122	0.96921	15.185	0.94950	18.461
48	1.00248	6.901	0.99840	9.383	0.99050	12.210	0.97779	15.334	0.95938	18.692
49	1.00672	6.912	1.00410	9.419	0.99780	12.285	0.98665	15.469	0.96966	18.908
50	1.01100	6.915	1.00991	9.443	1.00526	12.347	0.99578	15.588	0.98032	19.108
51	1.01533	6.908	1.01581	9.455	1.01289	12.395	1.00518	15.690	0.99136	19.290
52	1.01970	6.893	1.02181	9.457	1.02069	12.427	1.01486	15.777	1.00282	19.455
53	1.02412	6.870	1.02789	9.445	1.02864	12.444	1.02479	15.845	1.01469	19.600
54	1.02855	6.838	1.03403	9.423	1.03675	12.446	1.03500	15.895	1.02697	19.726
55	1.03300	6.797	1.04024	9.388	1.04501	12.432	1.04549	15.925	1.03970	19.828
56	1.03747	6.746	1.04653	9.338	1.05343	12.401	1.05626	15.934	1.05287	19.909
57	1.04195	6.685	1.05286	9.275	1.06196	12.353	1.06729	15.922	1.06648	19.965
58	1.04642	6.616	1.05921	9.200	1.07061	12.288	1.07854	15.889	1.08054	19.996
59	1.05089	6.537	1.06561	9.112	1.07939	12.203	1.09007	15.833	1.09506	19.998
60	1.05537	6.448	1.07210	9.010	1.08829	12.100	1.10188	15.753	1.11009	19.973
61	1.05980	6.350	1.07856	8.893	1.09726	11.978	1.11390	15.647	1.12555	19.918
62	1.06420	6.242	1.08500	8.762	1.10630	11.835	1.12614	15.514	1.14144	19.832
63	1.06858	6.124	1.09143	8.617	1.11540	11.673	1.13856	15.355	1.15777	19.711
64	1.07293	5.998	1.09783	8.458	1.12456	11.491	1.15116	15.169	1.17454	19.555
65	1.07722	5.862	1.10420	8.285	1.13373	11.288	1.16392	14.956	1.19173	19.362
66	1.08143	5.716	1.11053	8.098	1.14291	11.064	1.17684	14.711	1.20935	19.131
67	1.08560	5.561	1.11683	7.895	1.15208	10.820	1.18989	14.438	1.22737	18.860
68	1.08967	5.397	1.12299	7.678	1.16118	10.552	1.20298	14.132	1.24569	18.545
69	1.09363	5.223	1.12904	7.447	1.17020	10.263	1.21608	13.796	1.26429	18.188
70	1.09750	5.041	1.13500	7.202	1.17915	9.953	1.22919	13.428	1.28316	17.785
71	1.10125	4.850	1.14083	6.943	1.18796	9.621	1.24226	13.026	1.30221	17.334
72	1.10490	4.650	1.14651	6.671	1.19659	9.268	1.25524	12.592	1.32140	16.836
73	1.10842	4.441	1.15201	6.386	1.20503	8.894	1.26807	12.126	1.34063	16.290
74	1.11180	4.225	1.15734	6.087	1.21325	8.499	1.28067	11.628	1.35986	15.693
75	1.11503	4.002	1.16244	5.775	1.22121	8.083	1.29300	11.097	1.37894	15.043
76	1.11810	3.772	1.16733	5.450	1.22889	7.648	1.30500	10.532	1.39775	14.342
77	1.12102	3.534	1.17197	5.114	1.23623	7.192	1.31659	9.936	1.41620	13.591
78	1.12375	3.289	1.17636	4.767	1.24319	6.718	1.32772	9.309	1.43412	12.788
79	1.12628	3.038	1.18046	4.409	1.24976	6.227	1.33830	8.653	1.45141	11.935
80	1.12863	2.781	1.18427	4.042	1.25591	5.718	1.34827	7.966	1.46790	11.032
81	1.13078	2.519	1.18777	3.666	1.26158	5.195	1.35754	7.254	1.48345	10.081
82	1.13273	2.251	1.19094	3.281	1.26674	4.656	1.36607	6.517	1.49790	9.087
83	1.13447	1.979	1.19377	2.888	1.27138	4.104	1.37378	5.757	1.51110	8.052
84	1.13598	1.704	1.19626	2.488	1.27545	3.540	1.38059	4.975	1.52289	6.977
85	1.13727	1.425	1.19839	2.083	1.27895	2.966	1.38646	4.175	1.53314	5.868
86	1.13832	1.144	1.20013	1.672	1.28185	2.383	1.39132	3.360	1.54170	4.731
87	1.13915	0.860	1.20150	1.257	1.28413	1.794	1.39518	2.532	1.54848	3.571
88	1.13975	0.574	1.20247	0.839	1.28575	1.199	1.39793	1.692	1.55339	2.391
89	1.14010	0.287	1.20306	0.420	1.28671	0.600	1.39959	0.847	1.55637	1.198
90	1.14022	0.000	1.20327	0.000	1.28700	0.000	1.40017	0.000	1.55740	0.000

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh(0.9\,\underline{/75^\circ})}{0.9\,\underline{/75^\circ}} = 1.293\,\overline{\backslash 11^\circ.097} = 1.293\,\overline{\backslash 11^\circ.05'.49''}$.

TABLE V. CORRECTING FACTOR. $\dfrac{\tanh\theta}{\theta} = r\,\underline{/\gamma}.$ CONTINUED

	1.1		1.2		1.3		1.4		1.5	
°		°		°		°		°		°
45	0.90354	**21.167**	0.87142	**24.384**	0.83515	**27.536**	0.79593	**30.516**	0.75487	**33.288**
46	0.91359	**21.524**	0.88183	**24.856**	0.84561	**28.118**	0.80600	**31.225**	0.76427	**34.116**
47	0.92400	**21.869**	0.89275	**25.315**	0.85661	**28.699**	0.81664	**31.936**	0.77420	**34.952**
48	0.93482	**22.201**	0.90425	**25.764**	0.86815	**29.279**	0.82786	**32.648**	0.78467	**35.792**
49	0.94618	**22.520**	0.91625	**26.202**	0.88038	**29.852**	0.83971	**33.360**	0.79573	**36.638**
50	0.95809	**22.822**	0.92892	**26.629**	0.89331	**30.416**	0.85228	**34.070**	0.80747	**37.490**
51	0.97055	**23.109**	0.94225	**27.043**	0.90685	**30.973**	0.86557	**34.778**	0.81993	**38.348**
52	0.98345	**23.379**	0.95617	**27.442**	0.92123	**31.521**	0.87964	**35.485**	0.83320	**39.213**
53	0.99700	**23.630**	0.97083	**27.826**	0.93638	**32.059**	0.89457	**36.189**	0.84727	**40.086**
54	1.0111	**23.861**	0.98625	**28.193**	0.95238	**32.586**	0.91043	**36.890**	0.86220	**40.965**
55	1.0258	**24.070**	1.0025	**28.540**	0.96938	**33.100**	0.92729	**37.587**	0.87813	**41.849**
56	1.0412	**24.256**	1.0196	**28.867**	0.98738	**33.599**	0.94529	**38.279**	0.89513	**42.738**
57	1.0572	**24.417**	1.0375	**29.173**	1.0065	**34.082**	0.96443	**38.964**	0.91333	**43.634**
58	1.0739	**24.551**	1.0564	**29.454**	1.0266	**34.548**	0.98479	**39.642**	0.93280	**44.534**
59	1.0914	**24.657**	1.0763	**29.708**	1.0482	**34.993**	1.0066	**40.311**	0.95367	**45.441**
60	1.1096	**24.733**	1.0973	**29.932**	1.0710	**35.416**	1.0301	**40.968**	0.97613	**46.349**
61	1.1286	**24.774**	1.1195	**30.124**	1.0953	**35.813**	1.0551	**41.611**	1.0003	**47.262**
62	1.1484	**24.778**	1.1428	**30.280**	1.1212	**36.180**	1.0820	**42.239**	1.0264	**48.176**
63	1.1689	**24.745**	1.1674	**30.397**	1.1488	**36.515**	1.1109	**42.850**	1.0546	**49.092**
64	1.1904	**24.672**	1.1934	**30.473**	1.1784	**36.814**	1.1421	**43.438**	1.0851	**50.009**
65	1.2126	**24.554**	1.2208	**30.502**	1.2099	**37.072**	1.1759	**44.001**	1.1184	**50.924**
66	1.2357	**24.388**	1.2496	**30.480**	1.2436	**37.285**	1.2124	**44.535**	1.1546	**51.834**
67	1.2596	**24.173**	1.2799	**30.403**	1.2798	**37.446**	1.2520	**45.034**	1.1943	**52.739**
68	1.2845	**23.904**	1.3119	**30.263**	1.3185	**37.548**	1.2951	**45.493**	1.2377	**53.636**
69	1.3101	**23.579**	1.3457	**30.059**	1.3600	**37.585**	1.3420	**45.904**	1.2857	**54.520**
70	1.3365	**23.194**	1.3811	**29.781**	1.4046	**37.548**	1.3933	**46.260**	1.3385	**55.388**
71	1.3637	**22.744**	1.4183	**29.425**	1.4525	**37.430**	1.4495	**46.552**	1.3973	**56.235**
72	1.3915	**22.227**	1.4573	**28.983**	1.5039	**37.218**	1.5113	**46.768**	1.4628	**57.056**
73	1.4200	**21.639**	1.4981	**28.447**	1.5592	**36.899**	1.5794	**46.894**	1.5362	**57.841**
74	1.4489	**20.978**	1.5407	**27.810**	1.6186	**36.461**	1.6546	**46.916**	1.6190	**58.581**
75	1.4783	**20.238**	1.5849	**27.064**	1.6822	**35.890**	1.7380	**46.814**	1.7129	**59.266**
76	1.5077	**19.419**	1.6307	**26.202**	1.7505	**35.170**	1.8308	**46.567**	1.8202	**59.880**
77	1.5373	**18.518**	1.6778	**25.214**	1.8235	**34.280**	1.9341	**46.145**	1.9438	**60.403**
78	1.5665	**17.532**	1.7261	**24.094**	1.9012	**33.202**	2.0498	**45.514**	2.0875	**60.814**
79	1.5955	**16.462**	1.7749	**22.835**	1.9835	**31.912**	2.1792	**44.633**	2.2562	**61.076**
80	1.6235	**15.308**	1.8239	**21.429**	2.0702	**30.389**	2.3240	**43.454**	2.4563	**61.144**
81	1.6505	**14.069**	1.8726	**19.874**	2.1604	**28.609**	2.4862	**41.915**	2.6973	**60.956**
82	1.6759	**12.748**	1.9200	**18.168**	2.2531	**26.553**	2.6669	**39.944**	2.9917	**60.422**
83	1.6996	**11.350**	1.9654	**16.310**	2.3466	**24.200**	2.8668	**37.454**	3.3577	**59.412**
84	1.7212	**9.879**	2.0078	**14.306**	2.4388	**21.540**	3.0848	**34.354**	3.8207	**57.724**
85	1.7402	**8.343**	2.0463	**12.164**	2.5267	**18.568**	3.3164	**30.541**	4.4198	**55.045**
86	1.7562	**6.748**	2.0796	**9.898**	2.6065	**15.294**	3.5521	**25.931**	5.2010	**50.866**
87	1.7691	**5.105**	2.1068	**7.525**	2.6744	**11.747**	3.7765	**20.477**	6.2275	**44.356**
88	1.7785	**3.425**	2.1269	**5.067**	2.7266	**7.970**	3.9665	**14.214**	7.5060	**34.274**
89	1.7843	**1.719**	2.1393	**2.548**	2.7596	**4.029**	4.0952	**7.293**	8.7880	**19.305**
90	1.7862	**0.000**	2.1434	**0.000**	2.7709	**0.000**	4.1413	**0.000**	9.4007	**0.000**

Note. Negative quantities are in heavy type.

Example. $\dfrac{\tanh(1.3\,\underline{/45^\circ})}{1.3\,\underline{/45^\circ}} = 0.83515\,\overline{\backslash 27^\circ.536} = 0.83515\,\overline{\backslash 17^\circ.32'.10''}.$

Table V. CORRECTING FACTOR. $\frac{\tanh \theta}{\theta} = r \underline{/\gamma}$. Continued

°	1.6	°	1.7	°	1.8	°	1.9	°	2.0	°
45	0.71331	35.799	0.67224	38.016	0.63250	39.937	0.59484	41.562	0.55955	42.906
46	0.72175	36.733	0.67959	39.048	0.63883	41.050	0.60005	42.740	0.56375	44.133
47	0.73069	37.682	0.68741	40.098	0.64544	42.186	0.60553	43.942	0.56815	45.387
48	0.74013	38.642	0.69565	41.166	0.65239	43.341	0.61126	45.168	0.57275	46.667
49	0.75013	39.615	0.70435	42.251	0.65978	44.520	0.61726	46.422	0.57750	47.977
50	0.76069	40.600	0.71359	43.355	0.66756	45.725	0.62358	47.705	0.58250	49.319
51	0.77194	41.600	0.72329	44.480	0.67572	46.955	0.63026	49.019	0.58770	50.694
52	0.78381	42.616	0.73365	45.627	0.68433	48.213	0.63721	50.366	0.59315	52.103
53	0.79650	43.646	0.74465	46.797	0.69350	49.501	0.64458	51.747	0.59885	53.550
54	0.81000	44.691	0.75629	47.992	0.70317	50.820	0.65232	53.165	0.60480	55.039
55	0.82438	45.754	0.76865	49.212	0.71344	52.174	0.66047	54.621	0.61100	56.571
56	0.83969	46.834	0.78188	50.461	0.72433	53.564	0.66911	56.121	0.61750	58.149
57	0.85613	47.931	0.79600	51.739	0.73594	54.992	0.67821	57.666	0.62435	59.777
58	0.87369	49.047	0.81106	53.047	0.74828	56.460	0.68784	59.259	0.63150	61.458
59	0.89256	50.183	0.82724	54.389	0.76144	57.974	0.69805	60.905	0.63905	63.195
60	0.91288	51.339	0.84459	55.768	0.77550	59.535	0.70895	62.606	0.64695	64.995
61	0.93475	52.516	0.86324	57.181	0.79056	61.145	0.72047	64.366	0.65530	66.860
62	0.95834	53.714	0.88335	58.635	0.80672	62.810	0.73274	66.191	0.66405	68.793
63	0.98394	54.935	0.90506	60.131	0.82406	64.533	0.74579	68.085	0.67330	70.802
64	1.0117	56.181	0.92853	61.674	0.84272	66.318	0.75974	70.052	0.68310	72.891
65	1.0419	57.452	0.95400	63.266	0.86283	68.172	0.77463	72.099	0.69340	75.068
66	1.0749	58.748	0.98176	64.910	0.88461	70.098	0.79063	74.232	0.70430	77.338
67	1.1111	60.072	1.0121	66.613	0.90817	72.104	0.80774	76.459	0.71585	79.707
68	1.1508	61.425	1.0453	68.376	0.93372	74.196	0.82611	78.786	0.72810	82.184
69	1.1948	62.809	1.0817	70.209	0.96156	76.382	0.84579	81.221	0.74105	84.776
70	1.2433	64.224	1.1219	72.116	0.99189	78.671	0.86705	83.773	0.75475	87.490
71	1.2974	65.674	1.1663	74.106	1.0251	81.074	0.88989	86.454	0.76925	90.337
72	1.3580	67.160	1.2157	76.187	1.0614	83.602	0.91453	89.273	0.78465	93.326
73	1.4262	68.686	1.2708	78.371	1.1013	86.266	0.94111	92.244	0.80095	96.466
74	1.5033	70.256	1.3325	80.670	1.1452	89.084	0.96974	95.379	0.81815	99.769
75	1.5913	71.873	1.4020	83.101	1.1936	92.076	1.0005	98.692	0.83625	103.245
76	1.6924	73.543	1.4807	85.685	1.2470	95.261	1.0337	102.202	0.85525	106.905
77	1.8098	75.274	1.5704	88.447	1.3061	98.664	1.0693	105.925	0.87515	110.760
78	1.9473	77.078	1.6731	91.420	1.3714	102.315	1.1074	109.881	0.89585	114.820
79	2.1104	78.966	1.7915	94.644	1.4436	106.250	1.1478	114.088	0.91720	119.093
80	2.3068	80.960	1.9288	98.175	1.5231	110.510	1.1906	118.568	0.93905	123.590
81	2.5472	83.087	2.0894	102.083	1.6104	115.140	1.2352	123.344	0.96110	128.319
82	2.8474	85.390	2.2775	106.466	1.7056	120.191	1.2813	128.428	0.98305	133.281
83	3.2326	87.937	2.4992	111.446	1.8078	125.722	1.3279	133.842	1.0045	138.474
84	3.7435	90.839	2.7604	117.199	1.9155	131.793	1.3739	139.590	1.0249	143.894
85	4.4502	94.289	3.0648	123.945	2.0255	138.448	1.4179	145.673	1.0436	149.528
86	5.4825	98.668	3.4114	131.956	2.1329	145.720	1.4579	152.075	1.0601	155.359
87	7.1175	104.791	3.7856	141.527	2.2309	153.606	1.4921	158.768	1.0738	161.359
88	9.9938	114.760	4.1472	152.868	2.3107	162.043	1.5184	165.700	1.0840	167.494
89	15.528	135.011	4.4231	165.896	2.3628	170.905	1.5349	172.805	1.0904	173.723
90	21.395	180.000	4.5275	180.000	2.3813	180.000	1.5406	180.000	1.0925	180.000

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh (2.0 \underline{/80^\circ})}{2.0 \underline{/80^\circ}} = 0.93905 \overline{\backslash 123^\circ.590} = 0.93905 \overline{\backslash 123^\circ.35'.24''}.$

Table V. CORRECTING FACTOR. $\frac{\tanh \theta}{\theta} = r \underline{/\gamma}$. Continued

	2.1		2.2		2.3		2.4		2.5	
°		°		°		°		°		°
45	0.52690	**43.993**	0.49691	**44.845**	0.46952	**45.492**	0.44467	**45.961**	0.42212	**46.283**
46	0.53019	**45.254**	0.49941	**46.127**	0.47139	**46.783**	0.44592	**47.252**	0.42292	**47.564**
47	0.53362	**46.542**	0.50200	**47.436**	0.47322	**48.101**	0.44717	**48.567**	0.42368	**48.868**
48	0.53714	**47.859**	0.50465	**48.774**	0.47509	**49.446**	0.44842	**49.908**	0.42440	**50.195**
49	0.54081	**49.206**	0.50732	**50.142**	0.47696	**50.820**	0.44958	**51.277**	0.42504	**51.548**
50	0.54462	**50.586**	0.51009	**51.542**	0.47883	**52.226**	0.45075	**52.676**	0.42560	**52.929**
51	0.54852	**52.001**	0.51291	**52.978**	0.48070	**53.666**	0.45188	**54.107**	0.42612	**54.340**
52	0.55257	**53.452**	0.51578	**54.452**	0.48256	**55.144**	0.45292	**55.572**	0.42652	**55.782**
53	0.55681	**54.943**	0.51868	**55.965**	0.48443	**56.659**	0.45392	**57.073**	0.42684	**57.256**
54	0.56114	**56.476**	0.52168	**57.520**	0.48630	**58.215**	0.45488	**58.614**	0.42704	**58.766**
55	0.56562	**58.055**	0.52473	**59.120**	0.48813	**59.815**	0.45571	**60.196**	0.42712	**60.314**
56	0.57029	**59.682**	0.52782	**60.769**	0.48991	**61.462**	0.45646	**61.822**	0.42708	**61.903**
57	0.57514	**61.361**	0.53095	**62.469**	0.49170	**63.160**	0.45713	**63.496**	0.42688	**63.534**
58	0.58014	**63.094**	0.53414	**64.226**	0.49339	**64.912**	0.45767	**65.220**	0.42648	**65.211**
59	0.58533	**64.888**	0.53736	**66.042**	0.49504	**66.722**	0.45804	**66.998**	0.42588	**66.938**
60	0.59071	**66.745**	0.54064	**67.921**	0.49661	**68.594**	0.45829	**68.835**	0.42512	**68.718**
61	0.59629	**68.671**	0.54395	**69.869**	0.49813	**70.531**	0.45838	**70.735**	0.42412	**70.556**
62	0.60210	**70.669**	0.54732	**71.889**	0.49957	**72.540**	0.45829	**72.701**	0.42288	**72.455**
63	0.60814	**72.744**	0.55073	**73.988**	0.50087	**74.625**	0.45800	**74.740**	0.42140	**74.419**
64	0.61443	**74.902**	0.55418	**76.171**	0.50209	**76.791**	0.45750	**76.855**	0.41960	**76.455**
65	0.62090	**77.151**	0.55764	**78.443**	0.50317	**79.044**	0.45675	**79.053**	0.41752	**78.567**
66	0.62767	**79.496**	0.56109	**80.810**	0.50413	**81.390**	0.45579	**81.341**	0.41512	**80.761**
67	0.63471	**81.942**	0.56459	**83.280**	0.50491	**83.836**	0.45454	**83.723**	0.41240	**83.044**
68	0.64205	**84.499**	0.56814	**85.858**	0.50557	**86.389**	0.45300	**86.208**	0.40928	**85.424**
69	0.64962	**87.172**	0.57164	**88.552**	0.50604	**89.056**	0.45121	**88.802**	0.40580	**87.906**
70	0.65752	**89.968**	0.57518	**91.370**	0.50630	**91.843**	0.44913	**91.514**	0.40196	**90.500**
71	0.66571	**92.898**	0.57873	**94.319**	0.50639	**94.759**	0.44671	**94.352**	0.39771	**93.215**
72	0.67424	**95.968**	0.58223	**97.405**	0.50626	**97.811**	0.44396	**97.324**	0.39306	**96.061**
73	0.68305	**99.185**	0.58568	**100.636**	0.50596	**101.006**	0.44092	**100.439**	0.38802	**99.048**
74	0.69214	**102.560**	0.58914	**104.020**	0.50543	**104.352**	0.43754	**103.706**	0.38260	**102.187**
75	0.70152	**106.099**	0.59255	**107.564**	0.50470	**107.858**	0.43388	**107.134**	0.37681	**105.489**
76	0.71114	**109.811**	0.59586	**111.274**	0.50378	**111.531**	0.42992	**110.730**	0.37068	**108.966**
77	0.72096	**113.702**	0.59914	**115.156**	0.50265	**115.374**	0.42575	**114.505**	0.36427	**112.633**
78	0.73086	**117.778**	0.60232	**119.212**	0.50135	**119.392**	0.42138	**118.467**	0.35762	**116.501**
79	0.74090	**122.043**	0.60536	**123.446**	0.49991	**123.590**	0.41683	**122.620**	0.35080	**120.582**
80	0.75086	**126.501**	0.60832	**127.859**	0.49835	**127.968**	0.41221	**126.968**	0.34392	**124.887**
81	0.76067	**131.151**	0.61109	**132.449**	0.49674	**132.527**	0.40759	**131.517**	0.33706	**129.427**
82	0.77019	**135.989**	0.61364	**137.212**	0.49509	**137.264**	0.40305	**136.267**	0.33033	**134.209**
83	0.77924	**141.011**	0.61600	**142.140**	0.49343	**142.171**	0.39869	**141.212**	0.32391	**139.233**
84	0.78767	**146.210**	0.61814	**147.223**	0.49183	**147.237**	0.39463	**146.344**	0.31790	**144.499**
85	0.79524	**151.570**	0.62000	**152.449**	0.49039	**152.450**	0.39094	**151.650**	0.31248	**149.994**
86	0.80176	**157.070**	0.62155	**157.800**	0.48913	**157.793**	0.38775	**157.113**	0.30778	**155.703**
87	0.80710	**162.690**	0.62282	**163.254**	0.48804	**163.245**	0.38516	**162.710**	0.30396	**161.598**
88	0.81100	**168.406**	0.62374	**168.790**	0.48726	**168.781**	0.38325	**168.413**	0.30113	**167.645**
89	0.81338	**174.187**	0.62427	**174.381**	0.48678	**174.376**	0.38207	**174.188**	0.29940	**173.796**
90	0.81424	**180.000**	0.62445	**180.000**	0.48661	**180.000**	0.38167	**180.000**	0.29880	**180.000**

Note Negative quantities are in heavy type.

Example. $\frac{\tanh (2.3 \underline{/90^\circ})}{2.3 \underline{/90^\circ}} = 0.48661 \overline{\backslash 180^\circ} = 0.48661 \underline{/180^\circ}.$

Table V. CORRECTING FACTOR. $\frac{\tanh \theta}{\theta} = r \underline{/\gamma}$. Continued

	2.6		2.7		2.8		2.9		3.0	
°		°		°		°		°		°
45	0.40173	**46.480**	0.38326	**46.576**	0.36657	**46.595**	0.35145	**46.554**	0.33770	**46.468**
46	0.40215	**47.744**	0.38341	**47.821**	0.36650	**47.816**	0.35121	**47.748**	0.33733	**47.637**
47	0.40250	**49.030**	0.38348	**49.083**	0.36632	**49.051**	0.35086	**48.955**	0.33690	**48.815**
48	0.40281	**50.337**	0.38344	**50.365**	0.36607	**50.303**	0.35045	**50.175**	0.33637	**50.002**
49	0.40304	**51.667**	0.38333	**51.666**	0.36571	**51.572**	0.34997	**51.409**	0.33573	**51.198**
50	0.40319	**53.022**	0.38311	**52.988**	0.36525	**52.857**	0.34928	**52.656**	0.33497	**52.405**
51	0.40319	**54.403**	0.38278	**54.332**	0.36464	**54.160**	0.34848	**53.916**	0.33410	**53.622**
52	0.40308	**55.812**	0.38233	**55.700**	0.36389	**55.483**	0.34759	**55.191**	0.33307	**54.849**
53	0.40288	**57.250**	0.38174	**57.094**	0.36300	**56.826**	0.34652	**56.481**	0.33191	**56.086**
54	0.40254	**58.717**	0.38096	**58.513**	0.36196	**58.190**	0.34528	**57.788**	0.33058	**57.334**
55	0.40200	**60.219**	0.38000	**59.959**	0.36075	**59.577**	0.34386	**59.112**	0.32907	**58.593**
56	0.40131	**61.756**	0.37889	**61.437**	0.35932	**60.987**	0.34226	**60.452**	0.32737	**59.862**
57	0.40046	**63.331**	0.37756	**62.945**	0.35768	**62.422**	0.34043	**61.810**	0.32546	**61.141**
58	0.39942	**64.947**	0.37600	**64.487**	0.35580	**63.884**	0.33837	**63.186**	0.32332	**62.432**
59	0.39812	**66.606**	0.37422	**66.066**	0.35367	**65.374**	0.33602	**64.582**	0.32093	**63.735**
60	0.39658	**68.313**	0.37215	**67.684**	0.35126	**66.895**	0.33345	**65.999**	0.31827	**65.049**
61	0.39481	**70.069**	0.36980	**69.343**	0.34856	**68.449**	0.33056	**67.439**	0.31532	**66.375**
62	0.39273	**71.879**	0.36716	**71.048**	0.34554	**70.036**	0.32734	**68.904**	0.31206	**67.713**
63	0.39035	**73.747**	0.36416	**72.801**	0.34217	**71.660**	0.32378	**70.392**	0.30847	**69.063**
64	0.38765	**75.677**	0.36081	**74.607**	0.33843	**73.325**	0.31985	**71.907**	0.30451	**70.426**
65	0.38458	**77.675**	0.35709	**76.470**	0.33430	**75.033**	0.31552	**73.452**	0.30016	**71.801**
66	0.38115	**79.747**	0.35296	**78.393**	0.32974	**76.789**	0.31076	**75.027**	0.29539	**73.192**
67	0.37733	**81.898**	0.34841	**80.383**	0.32474	**78.599**	0.30556	**76.639**	0.29018	**74.598**
68	0.37310	**84.136**	0.34341	**82.449**	0.31927	**80.464**	0.29988	**78.289**	0.28450	**76.021**
69	0.36844	**86.469**	0.33794	**84.597**	0.31331	**82.396**	0.29369	**79.982**	0.27832	**77.463**
70	0.36333	**88.902**	0.33198	**86.833**	0.30683	**84.399**	0.28697	**81.722**	0.27161	**78.926**
71	0.35777	**91.451**	0.32553	**89.168**	0.29982	**86.482**	0.27970	**83.518**	0.26434	**80.414**
72	0.35176	**94.122**	0.31857	**91.613**	0.29226	**88.655**	0.27186	**85.378**	0.25649	**81.932**
73	0.34529	**96.929**	0.31109	**94.184**	0.28415	**90.931**	0.26343	**87.310**	0.24803	**83.485**
74	0.33837	**99.884**	0.30311	**96.893**	0.27548	**93.325**	0.25439	**89.328**	0.23894	**85.081**
75	0.33102	**103.003**	0.29464	**99.757**	0.26625	**95.857**	0.24475	**91.448**	0.22922	**86.729**
76	0.32328	**106.302**	0.28570	**102.799**	0.25648	**98.547**	0.23450	**93.690**	0.21883	**88.443**
77	0.31519	**109.799**	0.27634	**106.038**	0.24621	**101.421**	0.22366	**96.078**	0.20779	**90.241**
78	0.30680	**113.513**	0.26661	**109.505**	0.23546	**104.512**	0.21224	**98.647**	0.19610	**92.146**
79	0.29821	**117.466**	0.25659	**113.231**	0.22431	**107.861**	0.20030	**101.437**	0.18376	**94.191**
80	0.28950	**121.678**	0.24637	**117.249**	0.21284	**111.519**	0.18788	**104.504**	0.17082	**96.419**
81	0.28081	**126.171**	0.23609	**121.599**	0.20116	**115.543**	0.17507	**107.921**	0.15730	**98.893**
82	0.27227	**130.966**	0.22589	**126.322**	0.18943	**120.004**	0.16200	**111.784**	0.14329	**101.700**
83	0.26405	**136.078**	0.21597	**131.464**	0.17783	**124.989**	0.14880	**116.221**	0.12887	**104.976**
84	0.25633	**141.517**	0.20654	**137.060**	0.16660	**130.591**	0.13573	**121.403**	0.11419	**108.916**
85	0.24931	**147.286**	0.19786	**143.143**	0.15604	**136.907**	0.12307	**127.549**	0.099443	**113.839**
86	0.24319	**153.370**	0.19020	**149.722**	0.14651	**144.025**	0.11122	**134.931**	0.084970	**120.254**
87	0.23818	**159.740**	0.18384	**156.778**	0.13844	**151.988**	0.10074	**143.833**	0.071310	**128.990**
88	0.23446	**166.349**	0.17906	**164.253**	0.13224	**160.762**	0.092383	**154.456**	0.059383	**141.294**
89	0.23216	**173.129**	0.17609	**172.042**	0.12832	**170.195**	0.086890	**166.709**	0.050750	**158.480**
90	0.23138	**180.000**	0.17509	**180.000**	0.12698	**180.000**	0.084969	**180.000**	0.047517	**180.000**

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh (2.9 \underline{/85^\circ})}{2.9 \underline{/85^\circ}} = 0.12307 \overline{\backslash 127^\circ.549} = 0.12307 \overline{\backslash 127^\circ.32'.56''}.$

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho\,\underline{/45^\circ}) = r\,\underline{/\gamma}$

ρ	Sinh	° ′	Cosh	° ′	Tanh	° ′
0	0.	45.00	1.	0.	0.	45.00
0.1	0.10000	45.06	1.00001	0.17	0.09999	44.49
0.2	0.20000	45.23	1.00013	1.09	0.19997	44.14
0.3	0.30001	45.52	1.0007	2.35	0.29981	43.17
0.4	0.40005	46.32	1.0021	4.35	0.39921	41.57
0.5	0.50016	47.23	1.0052	7.08	0.49757	40.15
0.6	0.60042	48.27	1.0107	10.15	0.59406	38.11
0.7	0.70094	49.40	1.0198	13.53	0.68732	35.47
0.8	0.80184	51.06	1.0336	18.00	0.77577	33.06
0.9	0.90327	52.44	1.0533	22.34	0.85756	30.10
1.0	1.0055	54.32	1.0803	27.29	0.93077	27.03
1.1	1.1089	56.31	1.1157	32.41	0.99389	23.50
1.2	1.2138	58.41	1.1608	38.05	1.0457	20.36
1.3	1.3205	61.02	1.2163	43.35	1.0857	17.27
1.4	1.4297	63.34	1.2830	49.05	1.1143	14.29
1.5	1.5418	66.15	1.3616	54.33	1.1323	11.42
1.6	1.6575	69.07	1.4524	59.55	1.1413	9.12
1.7	1.7776	72.08	1.5556	65.09	1.1428	6.59
1.8	1.9029	75.18	1.6714	70.14	1.1385	5.04
1.9	2.0343	78.36	1.7999	75.10	1.1302	3.26
2.0	2.1726	82.01	1.9413	79.56	1.1191	2.06
2.1	2.3190	85.34	2.0958	84.33	1.1065	1.01
2.2	2.4745	89.12	2.2636	89.03	1.0932	0.09
2.3	2.6404	92.57	2.4449	93.26	1.0799	**0.29**
2.4	2.8177	96.46	2.6403	97.44	1.0672	**0.58**
2.5	3.0079	100.39	2.8502	101.56	1.0553	**1.17**
2.6	3.2121	104.36	3.0753	106.05	1.0445	**1.29**
2.7	3.4318	108.36	3.3163	110.10	1.0348	**1.34**
2.8	3.6685	112.39	3.5741	114.15	1.0264	**1.36**
2.9	3.9236	116.43	3.8497	118.16	1.0192	**1.33**
3.0	4.1986	120.48	4.1443	122.16	1.0131	**1.28**
3.1	4.4948	124.56	4.4589	126.15	1.0080	**1.19**
3.2	4.8154	129.02	4.7955	130.15	1.0041	**1.13**
3.3	5.1586	133.09	5.1541	134.13	1.0008	**1.04**
3.4	5.5306	137.17	5.5393	138.13	0.9984	**0.56**
3.5	5.9305	141.24	5.9356	142.12	0.9967	**0.48**
3.6	6.3603	145.31	6.3900	146.11	0.9954	**0.40**
3.7	6.8244	149.38	6.8606	150.10	0.9947	**0.32**
3.8	7.3228	153.44	7.3646	154.09	0.9943	**0.25**
3.9	7.8590	157.50	7.9047	158.10	0.9942	**0.20**
4.0	8.4351	161.57	8.4831	162.11	0.9943	**0.14**
4.1	9.0535	166.02	9.1024	166.12	0.9946	**0.10**
4.2	9.7198	170.07	9.7704	170.13	0.9948	**0.06**
4.3	10.434	174.11	10.481	174.15	0.9955	**0.04**
4.4	11.201	178.16	11.246	178.16	0.9960	**0.00**

Note. Negative quantities are in heavy type.

Examples. sinh $(1.7\,\underline{/45^\circ}) = 1.7776\,\underline{/72^\circ.08'}$.
tanh $(2.4\,\underline{/45^\circ}) = 1.0672\,\overline{\backslash 0^\circ.58'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho\,\underline{/45^\circ}) = r\,\underline{/\gamma}$. Continued

ρ	Cosech	° ′	Sech	°	Coth	° ′
0.	∞	**45.00**	1.	**0.**	∞	**45.00**
0.1	10.0000	**45.06**	0.99999	**0.17**	10.0000	**44.49**
0.2	5.0000	**45.23**	0.99987	**1.09**	5.0008	**44.14**
0.3	3.3333	**45.52**	0.9993	**2.35**	3.3355	**43.17**
0.4	2.4997	**46.32**	0.9979	**4.35**	2.5050	**41.57**
0.5	1.9984	**47.23**	0.9948	**7.08**	2.0096	**40.15**
0.6	1.6654	**48.27**	0.9894	**10.15**	1.6830	**38.11**
0.7	1.4268	**49.40**	0.9806	**13.53**	1.4549	**35.47**
0.8	1.2471	**51.06**	0.9675	**18.00**	1.2890	**33.06**
0.9	1.1070	**52.44**	0.9494	**22.34**	1.1660	**30.10**
1.0	0.9945	**54.32**	0.9256	**27.29**	1.0746	**27.03**
1.1	0.9018	**56.31**	0.8963	**32.41**	1.0061	**23.50**
1.2	0.8238	**58.41**	0.8614	**38.05**	0.9564	**20.36**
1.3	0.7573	**61.02**	0.8222	**43.35**	0.9211	**17.27**
1.4	0.6995	**63.34**	0.7793	**49.05**	0.8996	**14.29**
1.5	0.6486	**66.15**	0.7344	**54.33**	0.8831	**11.42**
1.6	0.6033	**69.07**	0.6885	**59.55**	0.8763	**9.12**
1.7	0.5625	**72.08**	0.6429	**65.09**	0.8751	**6.59**
1.8	0.5256	**75.18**	0.5981	**70.14**	0.8788	**5.04**
1.9	0.4916	**78.36**	0.5556	**75.10**	0.8848	**3.26**
2.0	0.4603	**82.01**	0.5151	**79.56**	0.8936	**2.06**
2.1	0.4312	**85.34**	0.4772	**84.33**	0.9038	**1.01**
2.2	0.4041	**89.12**	0.4418	**89.03**	0.9147	**0.09**
2.3	0.3788	**92.57**	0.4090	**93.26**	0.9260	0.29
2.4	0.3549	**96.46**	0.3788	**97.44**	0.9370	0.58
2.5	0.3325	**100.39**	0.3509	**101.56**	0.9476	1.17
2.6	0.3114	**104.36**	0.3252	**106.05**	0.9574	1.29
2.7	0.2914	**108.36**	0.3016	**110.10**	0.9663	1.34
2.8	0.2726	**112.39**	0.2798	**114.15**	0.9743	1.36
2.9	0.2549	**116.43**	0.2598	**118.16**	0.9812	1.33
3.0	0.2382	**120.48**	0.2413	**122.16**	0.9871	1.28
3.1	0.2225	**124.56**	0.2243	**126.15**	0.9920	1.19
3.2	0.2077	**129.02**	0.2085	**130.15**	0.9959	1.13
3.3	0.1939	**133.09**	0.1940	**134.13**	0.9992	1.04
3.4	0.1808	**137.17**	0.1805	**138.13**	1.0016	0.56
3.5	0.1686	**141.24**	0.1681	**142.12**	1.0033	0.48
3.6	0.1572	**145.31**	0.1565	**146.11**	1.0047	0.40
3.7	0.1465	**149.38**	0.1458	**150.10**	1.0053	0.32
3.8	0.1366	**153.44**	0.1358	**154.09**	1.0057	0.25
3.9	0.1272	**157.50**	0.1265	**158.10**	1.0058	0.20
4.0	0.1186	**161.57**	0 1179	**162.11**	1.0057	0.14
4.1	0.1105	**166.02**	0.1099	**166.12**	1.0054	0.10
4.2	0.1029	**170.07**	0.1024	**170.13**	1.0052	0.06
4.3	0.09584	**174.11**	0.09541	**174.15**	1.0045	0.04
4.4	0.08927	**178.16**	0.08892	**178.16**	1.0040	0.00

Note. Negative quantities are in heavy type.

Examples. cosech $(2.0\,\underline{/45^\circ}) = 0.4603\,\overline{\backslash 82^\circ.01'}$.
coth $(2.5\,\underline{/45^\circ}) = 0.9476\,\underline{/1^\circ.17'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \,\underline{/45^\circ}) = r \,\underline{/\gamma}$. Continued

ρ	Sinh	° ′	Cosh	° ′	Tanh	° ′
4.5	12.026	182.19	12.067	182.19	0.9966	0.00
4.6	12.909	186.23	12.948	186.21	0.9970	0.02
4.7	13.858	190.27	13.894	190.23	0.9974	0.04
4.8	14.876	194.30	14.909	194.26	0.9978	0.04
4.9	15.968	198.33	15.999	198.29	0.9980	0.04
5.0	17.140	202.36	17.169	202.32	0.9983	0.04
5.1	18.397	206.39	18.425	206.35	0.9985	0.04
5.2	19.747	210.42	19.772	210.38	0.9087	0.04
5.3	21.195	214.45	21.219	214.41	0.9989	0.04
5.4	22.750	218.48	22.772	218.44	0.9990	0.04
5.5	24.418	222.50	24.439	222.47	0.9992	0.03
5.6	26.219	226.53	26.238	226.51	0.9993	0.02
5.7	28.141	230.56	28.159	230.54	0.9994	0.02
5.8	30.192	234.59	30.209	234.57	0.9995	0.02
5.9	32.405	239.02	32.421	239.00	0.9996	0.02
6.0	34.784	243.05	34.798	243.04	0.9996	0.01

ρ	Cosech	° ′	Sech	° ′	Coth	° ′
4.5	0.08316	**182.19**	0.08288	**182.19**	1.0034	**0.00**
4.6	0.07746	**186.23**	0.07723	**186.21**	1.0030	**0.02**
4.7	0.07216	**190.27**	0.07197	**190.23**	1.0026	**0.04**
4.8	0.06722	**194.30**	0.06707	**194.26**	1.0022	**0.04**
4.9	0.06263	**198.33**	0.06250	**198.29**	1.0020	**0.04**
5.0	0.05834	**202.36**	0.05824	**202.32**	1.0017	**0.04**
5.1	0.05436	**206.39**	0.05428	**206.35**	1.0015	**0.04**
5.2	0.05064	**210.42**	0.05058	**210.38**	1.0013	**0.04**
5.3	0.04718	**214.45**	0.04713	**214.41**	1.0011	**0.04**
5.4	0.04396	**218.48**	0.04391	**218.44**	1.0010	**0.04**
5.5	0.04095	**222.50**	0.04092	**222.47**	1.0008	**0.03**
5.6	0.03814	**226.53**	0.03811	**226.51**	1.0007	**0.02**
5.7	0.03554	**230.56**	0.03551	**230.54**	1.0006	**0.02**
5.8	0.03312	**234.59**	0.03310	**234.57**	1.0005	**0.02**
5.9	0.03086	**239.02**	0.03085	**239.00**	1.0004	**0.02**
6.0	0.02875	**243.05**	0.02874	**243.04**	1.0004	**0.01**

Note. Negative quantities are in heavy type.

Examples. $\tanh(6.0 \,\underline{/45^\circ}) = 0.9996 \,\underline{/0^\circ.01'}$.
$\text{sech}\,(5.0 \,\underline{/45^\circ}) = 0.05824 \,\overline{\backslash 202^\circ.32'}$.

TABLE VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \underline{/45°}) = r \underline{/\gamma}$. CONTINUED

ρ	Sinh and cosh		Tanh and coth		Sech and cosech	
		° ′		°		° ′
6.05	36.047	245.06	1.000	0.00	2.774×10⁻²	**245.06**
6.10	37.349	247.08	1.000	0.00	2.678 "	**247.08**
6.15	38.693	249.09	1.000	0.00	2.583 "	**249.09**
6.20	40.084	251.11	1.000	0.00	2.495 "	**251.11**
6.25	41.524	253.12	1.000	0.00	2.408 "	**253.12**
6.30	43.020	255.14	1.000	0.00	2.325 "	**255.14**
6.35	44.563	257.15	1.000	0.00	2.244 "	**257.15**
6.40	46.171	259.17	1.000	0.00	2.166 "	**259.17**
6.45	47.832	261.18	1.000	0.00	2.091 "	**261.18**
6.50	49.553	263.20	1.000	0.00	2.018 "	**263.20**
6.55	51.336	265.22	1.000	0.00	1.948 "	**265.22**
6.60	53.183	267.24	1.000	0.00	1.880 "	**267.24**
6.65	55.110	269.25	1.000	0.00	1.815 "	**269.25**
6.70	57.058	271.27	1.000	0.00	1.752 "	**271.27**
6.75	59.136	273.28	1.000	0.00	1.691 "	**273.28**
6.80	61.259	275.30	1.000	0.00	1.632 "	**275.30**
6.85	63.463	277.31	1.000	0.00	1.576 "	**277.31**
6.90	65.746	279.33	1.000	0.00	1.521 "	**279.33**
6.95	68.119	281.34	1.000	0.00	1.468 "	**281.34**
7.00	70.570	283.36	1.000	0.00	1.417 "	**283.36**
7.05	73.109	285.37	1.000	0.00	1.368 "	**285.37**
7.10	75.739	287.39	1.000	0.00	1.312 "	**287.39**
7.15	78.473	289.40	1.000	0.00	1.274 "	**289.40**
7.20	81.296	291.42	1.000	0.00	1.230 "	**291.42**
7.25	84.215	293.43	1.000	0.00	1.187 "	**293.43**
7.30	87.250	295.45	1.000	0.00	1.146 "	**295.45**
7.35	90.386	297.46	1.000	0.00	1.016 "	**297.46**
7.40	93.083	299.48	1.000	0.00	1.074 "	**299.48**
7.45	97.009	301.49	1.000	0.00	1.031 "	**301.49**
7.50	100.50	303.51	1.000	0.00	9.950×10⁻³	**303.51**
7.55	104.12	305.52	1.000	0.00	9.605 "	**305.52**
7.60	107.86	307.54	1.000	0.00	9.271 "	**307.54**
7.65	111.74	309.56	1.000	0.00	8.949 "	**309.56**
7.70	115.67	311.57	1.000	0.00	8.638 "	**311.57**
7.75	119.94	313.59	1.000	0.00	8.337 "	**313.59**
7.80	124.26	316.00	1.000	0.00	8.048 "	**316.00**
7.85	128.71	318.02	1.000	0.00	7.769 "	**318.02**
7.90	133.35	320.03	1.000	0.00	7.499 "	**320.03**
7.95	138.16	322.05	1.000	0.00	7.238 "	**322.05**
8.00	143.12	324.06	1.000	0.00	6.987 "	**324.06**
8.05	148.28	326.07	1.000	0.00	6.744 "	**326.07**
8.10	153.61	328.09	1.000	0.00	6.510 "	**328.09**
8.15	159.14	330.11	1.000	0.00	6.284 "	**330.11**
8.20	164.87	332.12	1.000	0.00	6.066 "	**332.12**
8.25	170.80	334.14	1.000	0.00	5.855 "	**334.14**

Note. Negative quantities are in heavy type.

Examples. $\sinh(7.55 \underline{/45°}) = \cosh(7.55 \underline{/45°}) = 104.12 \underline{/305°.52'}$.
$\text{sech}(7.50 \underline{/45°}) = \text{cosech}(7.50 \underline{/45°}) = 9.950 \times 10^{-3} \overline{\backslash 303°.51'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \underline{/45^\circ}) = r \underline{/\gamma}$. Continued

ρ	Sinh and cosh		Tanh and coth		Sech and cosech	
		° ′		°		° ′
8.30	176.95	336.15	1.000	0.00	5.651×10^{-3}	**336.15**
8.35	183.31	338.17	1.000	0.00	5.455 "	**338.17**
8.40	189.91	340.18	1.000	0.00	5.266 "	**340.18**
8.45	196.75	342.20	1.000	0.00	5.083 "	**342.20**
8.50	203.83	344.22	1.000	0.00	4.906 "	**344.22**
8.55	211.16	346.24	1.000	0.00	4.736 "	**346.24**
8.60	218.76	348.25	1.000	0.00	4.571 "	**348.25**
8.65	226.63	350.27	1.000	0.00	4.413 "	**350.27**
8.70	234.79	352.28	1.000	0.00	4.259 "	**352.28**
8.75	243.23	354.30	1.000	0.00	4.111 "	**354.30**
8.80	251.99	356.31	1.000	0.00	3.968 "	**356.31**
8.85	261.06	358.33	1.000	0.00	3.830 "	**358.33**
8.90	270.46	360.34	1.000	0.00	3.698 "	**360.34**
8.95	280.19	362.36	1.000	0.00	3.569 "	**362.36**
9.00	290.28	364.38	1.000	0.00	3.445 "	**364.38**
9.05	300.73	366.39	1.000	0.00	3.3253 "	**366.39**
9.10	311.54	368.41	1.000	0.00	3.2099 "	**368.41**
9.15	322.75	370.42	1.000	0.00	3.0983 "	**370.42**
9.20	334.37	372.44	1.000	0.00	2.9908 "	**372.44**
9.25	346.39	374.46	1.000	0.00	2.8869 "	**374.46**
9.30	358.85	376.47	1.000	0.00	2.7867 "	**376.47**
9.35	371.81	378.48	1.000	0.00	2.6895 "	**378.48**
9.40	385.15	380.50	1.000	0.00	2.5964 "	**380.50**
9.45	399.04	382.51	1.000	0.00	2.5060 "	**382.51**
9.50	413.38	384.53	1.000	0.00	2.4191 "	**384.53**
9.55	428.26	386.55	1.000	0.00	2.3350 "	**386.55**
9.60	443.67	388.56	1.000	0.00	2.2540 "	**388.56**
9.65	446.93	390.57	1.000	0.00	2.2263 "	**390.57**
9.70	476.18	392.59	1.000	0.00	2.1001 "	**392.59**
9.75	493.31	395.01	1.000	0.00	2.0271 "	**395.01**
9.80	511.07	397.02	1.000	0.00	1.9567 "	**397.02**
9.85	529.46	399.03	1.000	0.00	1.8887 "	**399.03**
9.90	548.52	401.05	1.000	0.00	1.8231 "	**401.05**
9.95	568.25	403.07	1.000	0.00	1.7598 "	**403.07**
10.00	588.69	405.08	1.000	0.00	1.6987 "	**405.08**
10.05	609.89	407.09	1.000	0.00	1.6397 "	**407.09**
10.10	631.84	409.11	1.000	0.00	1.5827 "	**409.11**
10.15	654.58	411.13	1.000	0.00	1.5277 "	**411.13**
10.20	678.14	413.14	1.000	0.00	1.4746 "	**413.14**
10.25	702.53	415.15	1.000	0.00	1.4234 "	**415.15**
10.30	727.81	417.17	1.000	0.00	1.3740 "	**417.17**
10.35	754.01	419.19	1.000	0.00	1.3262 "	**419.19**
10.40	781.14	421.21	1.000	0.00	1.2802 "	**421.21**
10.45	809.26	423.23	1.000	0.00	1.2357 "	**423.23**
10.50	838.38	425.24	1.000	0.00	1.1928 "	**425.24**

Note. Negative quantities are in heavy type.

Examples.

sinh $(10.0 \underline{/45^\circ})$ = cosh $(10.0 \underline{/45^\circ}) = 588.69 \underline{/405^\circ.08'}$.

sech $(10.0 \underline{/45^\circ})$ = cosech $(10.0 \underline{/45^\circ}) = 1.6987 \times 10^{-3} \overline{\backslash 405^\circ.08'} = 1.6987 \times 10^{-3} \overline{\backslash 45^\circ.08'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho\,/45^\circ) = r\,/\gamma$. Continued

ρ	Sinh and cosh	° ′	Tanh and coth	°	Sech and cosech	° ′
10.55	868.56	427.26	1.000	0.00	1.1513×10^{-3}	**427.26**
10.60	899.81	429.27	1.000	0.00	1.1113 “	**429.27**
10.65	932.18	431.29	1.000	0.00	1.0728 “	**431.29**
10.70	965.74	433.30	1.000	0.00	1.0555 “	**433.30**
10.75	1,000.5	435.32	1.000	0.00	9.9952×10^{-4}	**435.32**
10.80	1,036.5	437.33	1.000	0.00	9.6478 “	**437.33**
10.85	1,073.8	439.35	1.000	0.00	9.3128 “	**439.35**
10.90	1,112.4	441.36	1.000	0.00	8.9892 “	**441.36**
10.95	1,152.5	443.38	1.000	0.00	8.6770 “	**443.38**
11.00	1,194.0	445.39	1.000	0.00	8.3750 “	**445.39**
11.05	1,237.0	447.41	1.000	0.00	8.0845 “	**447.41**
11.10	1,281.5	449.42	1.000	0.00	7.8037 “	**449.42**
11.15	1,327.5	451.44	1.000	0.00	7.5327 “	**451.44**
11.20	1,375.3	453.46	1.000	0.00	7.2711 “	**453.46**
11.25	1,424.8	455.47	1.000	0.00	7.0184 “	**455.47**
11.30	1,476.1	457.48	1.000	0.00	6.7747 “	**457.48**
11.35	1,529.2	459.50	1.000	0.00	6.5393 “	**459.50**
11.40	1,584.3	561.52	1.000	0.00	6.3120 “	**461.52**
11.45	1,641.4	463.53	1.000	0.00	6.0929 “	**463.53**
11.50	1,700.3	465.54	1.000	0.00	5.8811 “	**465.54**
11.55	1,761.5	467.56	1.000	0.00	5.6769 “	**467.56**
11.60	1,824.9	469.57	1.000	0.00	5.4797 “	**469.57**
11.65	1,890.6	471.59	1.000	0.00	5.2893 “	**471.59**
11.70	1,958.6	474.01	1.000	0.00	5.1056 “	**474.01**
11.75	2,029.1	476.03	1.000	0.00	4.9282 “	**476.03**
11.80	2,102.1	478.04	1.000	0.00	4.7571 “	**478.04**
11.85	2,177.8	480.05	1.000	0.00	4.5910 “	**480.05**
11.90	2,256.1	482.07	1.000	0.00	4.4323 “	**482.07**
11.95	2,337.3	484.09	1.000	0.00	4.2784 “	**484.09**
12.00	2,421.5	486.10	1.000	0.00	4.1297 “	**486.10**
12.05	2,508.6	488.12	1.000	0.00	3.9862 “	**488.12**
12.10	2,598.9	490.14	1.000	0.00	3.8478 “	**490.14**
12.15	2,692.6	492.15	1.000	0.00	3.7141 “	**492.15**
12.20	2,789.0	494.17	1.000	0.00	3.5856 “	**494.17**
12.25	2,889.7	496.18	1.000	0.00	3.4605 “	**496.18**
12.30	2,993.7	498.20	1.000	0.00	3.3403 “	**498.20**
12.35	3,101.4	500.21	1.000	0.00	3.2243 “	**500.21**
12.40	3,213.1	502.23	1.000	0.00	3.0143 “	**502.23**
12.45	3,328.3	504.24	1.000	0.00	3.0042 “	**504.24**
12.50	3,448.5	506.26	1.000	0.00	2.8998 “	**506.26**
12.55	3,572.6	508.27	1.000	0.00	2.7991 “	**508.27**
12.60	3,701.1	510.29	1.000	0.00	2.7019 “	**510.29**
12.65	3,834.3	512.31	1.000	0.00	2.6080 “	**512.31**
12.70	3,972.6	514.32	1.000	0.00	2.5172 “	**514.32**
12.75	4,115.3	516.33	1.000	0.00	2.4300 “	**516.33**

Note. Negative quantities are in heavy type.

Examples. sinh (12.0 /45°) = cosh (12.0 /45°) = 2421.5 /486°.10′ = 2421.5 **/126°.10′.**
sech (12.75 /45°) = cosech (12.75 /45°) = 2.43×10^{-3} **\516°.33′.**

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \underline{/45^\circ}) = r \underline{/\gamma}$. Continued

ρ	Sinh and cosh		Tanh and coth		Sech and cosech	
		° ′		°		° ′
12.80	4,263.4	518.35	1.000	0.00	2.3455 × 10⁻⁴	**518.35**
12.85	4,416.8	520.37	1.000	0.00	2.2641 "	**520.37**
12.90	4,575.7	522.38	1.000	0.00	2.1854 "	**522.38**
12.95	4,740.5	524.39	1.000	0.00	2.1095 "	**524.39**
13.00	4,911.0	526.41	1.000	0.00	2.0362 "	**526.41**
13.05	5,087.8	528.43	1.000	0.00	1.9655 "	**528.43**
13.10	5,270.9	530.44	1.000	0.00	1.8972 "	**430.44**
13.15	5,460.6	532.45	1.000	0.00	1.8313 "	**532.45**
13.20	5,657.0	534.47	1.000	0.00	1.7677 "	**534.47**
13.25	5,858.5	536.49	1.000	0.00	1.7061 "	**536.49**
13.30	6,071.6	538.50	1.000	0.00	1.6470 "	**538.50**
13.35	6,290.1	540.51	1.000	0.00	1.5898 "	**540.51**
13.40	6,516.5	542.53	1.000	0.00	1.5346 "	**542.53**
13.45	6,751.0	544.55	1.000	0.00	1.4813 "	**544.55**
13.50	6,993.9	546.57	1.000	0.00	1.4298 "	**546.57**
13.55	7,245.5	548.58	1.000	0.00	1.3801 "	**548.58**
13.60	7,506.4	551.00	1.000	0.00	1.3322 "	**551.00**
13.65	7,776.4	553.01	1.000	0.00	1.2859 "	**553.01**
13.70	8,056.4	555.03	1.000	0.00	1.2412 "	**555.03**
13.75	8,346.2	557.05	1.000	0.00	1.1982 "	**557.05**
13.80	8,646.7	559.06	1.000	0.00	1.1565 "	**559.06**
13.85	8,957.8	561.07	1.000	0.00	1.1164 "	**561.07**
13.90	9,280.3	563.09	1.000	0.00	1.0776 "	**563.09**
13.95	9,614.1	565.11	1.000	0.00	1.0165 "	**565.11**
14.00	9,960.2	567.12	1.000	0.00	1.0040 "	**567.12**
14.05	10,318	569.14	1.000	0.00	9.6914 × 10⁻⁵	**569.14**
14.10	10,690	571.15	1.000	0.00	9.3547 "	**571.15**
14.15	11,075	573.16	1.000	0.00	9.0296 "	**573.16**
14.20	11,473	575.18	1.000	0.00	8.7160 "	**575.18**
14.25	11,886	577.20	1.000	0.00	8.4132 "	**577.20**
14.30	12,314	579.21	1.000	0.00	8.1210 "	**579.21**
14.35	12,757	581.22	1.000	0.00	7.8388 "	**581.22**
14.40	13,216	583.24	1.000	0.00	7.5666 "	**583.24**
14.45	13,692	585.26	1.000	0.00	7.3037 "	**585.26**
14.50	14,184	587.27	1.000	0.00	7.0500 "	**587.27**
14.55	14,695	589.29	1.000	0.00	6.8050 "	**289.29**
14.60	15,224	591.30	1.000	0.00	6.5687 "	**591.30**
14.65	15,772	593.32	1.000	0.00	6.3405 "	**593.32**
14.70	16,339	595.34	1.000	0.00	6.1203 "	**595.34**
14.75	16,927	597.35	1.000	0.00	5.9077 "	**597.35**
14.80	17,536	599.37	1.000	0.00	5.7024 "	**599.37**
14.85	18,167	601.39	1.000	0.00	5.5044 "	**601.39**
14.90	18,822	603.40	1.000	0.00	5.3130 "	**603.40**
14.95	19,498	605.41	1.000	0.00	5.1286 "	**605.41**
15.00	20,200	607.43	1.000	0.00	4.9504 "	**607.43**

Note. Negative quantities are in heavy type.

Examples. $\sinh(14.0 \underline{/45^\circ}) = \cosh(14.0 \underline{/45^\circ}) = 9960.2 \underline{/567^\circ.12'}$.

$\text{sech}(14.0 \underline{/45^\circ}) = \text{cosech}(14.0 \underline{/45^\circ}) = 1.0040 \times 10^{-4} \overline{\backslash 567^\circ.12'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \angle 45°) = r \angle \gamma$. Continued

ρ	Sinh and cosh	° ′	Tanh and coth	°	Sech and cosech	° ′
15.05	20,927	609.44	1.000	0.00	4.7785×10^{-5}	**609.44**
15.10	21,680	611.46	1.000	0.00	4.6120 “	**611.46**
15.15	22,460	613.48	1.000	0.00	4.4523 “	**613.48**
15.20	23,269	615.49	1.000	0.00	4.2980 “	**615.49**
15.25	24,106	617.50	1.000	0.00	4.1482 “	**617.50**
15.30	24,973	619.52	1.000	0.00	4.0040 “	**619.52**
15.35	25,873	621.54	1.000	0.00	3.8651 “	**621.54**
15.40	26,802	623.55	1.000	0.00	3.7310 “	**623.55**
15.45	27,768	625.57	1.000	0.00	3.6012 “	**625.57**
15.50	28,765	627.59	1.000	0.00	3.4760 “	**627.59**
15.55	29,803	630.00	1.000	0.00	3.3554 “	**630.00**
15.60	30,872	632.02	1.000	0.00	3.2390 “	**632.02**
15.65	31,987	634.04	1.000	0.00	3.1263 “	**634.04**
15.70	33,140	636.05	1.000	0.00	3.0170 “	**636.05**
15.75	34,331	638.06	1.000	0.00	2.9129 “	**638.06**
15.80	35,569	640.08	1.000	0.00	2.8110 “	**640.08**
15.85	36,846	642.10	1.000	0.00	2.7140 “	**642.10**
15.90	38,174	644.11	1.000	0.00	2.6200 “	**644.11**
15.95	39,546	646.12	1.000	0.00	2.5287 “	**646.12**
16.00	40,970	648.14	1.000	0.00	2.4410 “	**648.14**
16.05	42,443	650.16	1.000	0.00	2.3561 “	**650.16**
16.10	43,971	652.17	1.000	0.00	2.2740 “	**652.17**
16.15	45,553	654.18	1.000	0.00	2.1952 “	**654.18**
16.20	47,192	656.20	1.000	0.00	2.1190 “	**656.20**
16.25	48,890	658.22	1.000	0.00	2.0454 “	**658.22**
16.30	50,649	660.23	1.000	0.00	1.9740 “	**660.23**
16.35	52,473	662.24	1.000	0.00	1.9055 “	**662.24**
16.40	54,359	664.26	1.000	0.00	1.8400 “	**664.26**
16.45	56,316	666.28	1.000	0.00	1.7757 “	**666.28**
16.50	58,475	668.29	1.000	0.00	1.7100 “	**668.29**
16.55	60,444	670.31	1.000	0.00	1.6544 “	**670.31**
16.60	62,619	672.32	1.000	0.00	1.5969 “	**672.32**
16.65	64,872	674.34	1.000	0.00	1.5415 “	**674.34**
16.70	57,208	676.35	1.000	0.00	1.4879 “	**676.35**
16.75	69,626	678.36	1.000	0.00	1.4362 “	**678.36**
16.80	72,132	680.38	1.000	0.00	1.3863 “	**680.38**
16.85	74,727	682.40	1.000	0.00	1.3382 “	**682.40**
16.90	77,418	684.41	1.000	0.00	1.2917 “	**684.41**
16.95	80,203	686.43	1.000	0.00	1.2468 “	**686.43**
17.00	83,088	688.45	1.000	0.00	1.2035 “	**688.45**
17.05	86,080	690.47	1.000	0.00	1.1617 “	**690.47**
17.10	89,176	692.48	1.000	0.00	1.1214 “	**692.48**
17.15	92,387	694.49	1.000	0.00	1.0824 “	**694.49**
17.20	95,711	696.51	1.000	0.00	1.0448 “	**696.51**
17.25	99,149	698.53	1.000	0.00	1.0086 “	**698.53**

Note. Negative quantities are in heavy type.

Examples. $\sinh(17.0 \angle 45°) = \cosh(17.0 \angle 45°) = 83{,}088 \angle 688°.45' = 83{,}088 \angle 328°.45'$.
$\text{sech}(17.0 \angle 45°) = \text{cosech}(17.0 \angle 45°) = 1.2035 \times 10^{-5} \overline{\backslash 688°.45'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho\,\underline{/45^\circ}) = r\,\underline{/\gamma}$. Continued

ρ	Sinh and cosh		Tanh and coth		Sech and cosech	
		° ′		°		° ′
17.30	102,720	700.54	1.000	0.00	9.7349 × 10^{-6}	**700.54**
17.35	106,420	702.55	1.000	0.00	9.3968 "	**702.55**
17.40	110,250	704.57	1.000	0.00	9.0703 "	**704.57**
17.45	114,220	706.59	1.000	0.00	8.7551 "	**706.59**
17.50	118,330	709.00	1.000	0.00	8.4510 "	**709.00**
17.55	122,590	711.01	1.000	0.00	8.1576 "	**711.01**
17.60	127,000	713.03	1.000	0.00	7.8741 "	**713.03**
17.65	131,570	715.05	1.000	0.00	7.6006 "	**715.05**
17.70	136,300	717.06	1.000	0.00	7.3365 "	**717.06**
17.75	141,210	719.07	1.000	0.00	7.0817 "	**719.07**
17.80	146,290	721.09	1.000	0.00	6.8356 "	**721.09**
17.85	151,550	723.11	1.000	0.00	6.5983 "	**723.11**
17.90	157,000	725.12	1.000	0.00	6.3710 "	**725.12**
17.95	162,660	727.13	1.000	0.00	6.1478 "	**727.13**
18.00	168,520	729.15	1.000	0.00	5.9383 "	**729.15**
18.05	174,580	731.17	1.000	0.00	5.7281 "	**731.17**
18.10	180,860	733.18	1.000	0.00	5.5292 "	**733.18**
18.15	183,530	735.20	1.000	0.00	5.4488 "	**735.20**
18.20	194,110	737.21	1.000	0.00	5.1517 "	**737.21**
18.25	201,100	739.23	1.000	0.00	4.9727 "	**739.23**
18.30	208,330	741.24	1.000	0.00	4.8000 "	**741.24**
18.35	215,830	743.26	1.000	0.00	4.6332 "	**743.26**
18.40	223,600	745.27	1.000	0.00	4.4723 "	**745.27**
18.45	231,650	747.29	1.000	0.00	4.3168 "	**747.29**
18.50	239,980	749.31	1.000	0.00	4.1671 "	**749.31**
18.55	248,620	751.32	1.000	0.00	4.0222 "	**751.32**
18.60	257,570	753.34	1.000	0.00	3.8825 "	**753.34**
18.65	266,840	755.35	1.000	0.00	3.7476 "	**755.35**
18.70	276,440	757.37	1.000	0.00	3.6174 "	**757.37**
18.75	286,390	759.38	1.000	0.00	3.4918 "	**759.38**
18.80	296,690	761.40	1.000	0.00	3.3628 "	**761.40**
18.85	307,380	763.41	1.000	0.00	3.2533 "	**763.41**
18.90	318,570	765.43	1.000	0.00	3.1404 "	**765.43**
18.95	329,890	767.44	1.000	0.00	3.0313 "	**767.44**
19.00	341,770	769.46	1.000	0.00	2.9260 "	**769.46**
19.05	354,060	771.47	1.000	0.00	2.8244 "	**771.47**
19.10	366,810	773.49	1.000	0.00	2.7262 "	**773.49**
19.15	380,010	775.50	1.000	0.00	2.6315 "	**775.50**
19.20	393,690	777.52	1.000	0.00	2.5401 "	**777.52**
19.25	407,850	779.53	1.000	0.00	2.4519 "	**779.53**
19.30	422,530	781.55	1.000	0.00	2.3667 "	**781.55**
19.35	437,730	783.57	1.000	0.00	2.2845 "	**783.57**
19.40	453,490	785.59	1.000	0.00	2.2051 "	**785.59**
19.45	469,810	788.00	1.000	0.00	2.1285 "	**788.00**
19.50	486,720	790.02	1.000	0.00	2.0546 "	**790.02**

Note. Negative qyantities are in heavy type.

Examples. sinh $(19.05\,\underline{/45^\circ})$ = cosh $(19.05\,\underline{/45^\circ}) = 354{,}060\,\underline{/771^\circ.47'} = 354{,}060\,\underline{/51^\circ.47'}$.
sech $(19.30\,\underline{/45^\circ})$ = cosech $(19.3\,\underline{/45^\circ}) = 2.3667 \times 10^{-6}\,\overline{\backslash 781^\circ.55'}$.

Table VI

FUNCTIONS OF SEMI-IMAGINARIES. $f(\rho \angle 45^\circ) = r \angle \gamma$. Continued

ρ	Sinh and cosh	° ′	Tanh and coth	°	Sech and cosech	° ′
19.55	504,230	792.03	1.000	0.00	1.9832×10^{-6}	**792.03**
19.60	522,380	794.05	1.000	0.00	1.9153 "	**794.05**
19.65	541,220	796.06	1.000	0.00	1.8478 "	**796.06**
19.70	560,650	798.08	1.000	0.00	1.7837 "	**798.08**
19.75	599,830	800.09	1.000	0.00	1.6671 "	**800.09**
19.80	601,730	802.11	1.000	0.00	1.6619 "	**802.11**
19.85	623,390	804.12	1.000	0.00	1.6041 "	**804.12**
19.90	645,820	806.14	1.000	0.00	1.5484 "	**806.14**
19.95	669,070	808.15	1.000	0.00	1.4946 "	**808.15**
20.00	693,150	810.17	1.000	0.00	1.4426 "	**810.17**
20.05	718,090	812.18	1.000	0.00	1.3926 "	**812.18**
20.10	743,930	814.20	1.000	0.00	1.3442 "	**814.20**
20.15	770,710	816.21	1.000	0.00	1.2975 "	**816.21**
20.20	798,440	818.23	1.000	0.00	1.2525 "	**818.23**
20.25	827,160	820.24	1.000	0.00	1.2090 "	**820.24**
20.30	856,940	822.26	1.000	0.00	1.1669 "	**822.26**
20.35	887,770	824.27	1.000	0.00	1.1264 "	**824.27**
20.40	919,730	826.29	1.000	0.00	1.0873 "	**826.29**
20.45	952,820	828.30	1.000	0.00	1.0496 "	**828.30**
20.50	987,120	830.32	1.000	0.00	1.0130 "	**830.32**

Note. Negative quantities are in heavy type.

Example. sinh $(20.0 \angle 45^\circ)$ = cosh $(20.0 \angle 45^\circ)$ = 693,150 $\angle 810^\circ.17'$ = 693,150 $\angle 90^\circ.17'$.

Table VII. HYPERBOLIC SINES. $\sinh(x + iq) = u + iv$

q	$x = 0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
0.0	0.00	0.00	0.05002	0.00	0.10017	0.00	0.15056	0.00	0.20134	0.00
0.05	0.00	0.07846	0.04987	0.07856	0.09986	0.07885	0.15010	0.07934	0.20072	0.08003
0.1	0.00	0.15643	0.04945	0.15663	0.09893	0.15722	0.14871	0.15820	0.19886	0.15957
0.15	0.00	0.23345	0.04864	0.23374	0.09740	0.23461	0.14640	0.23608	0.19577	0.23813
0.2	0.00	0.30902	0.04757	0.30940	0.09526	0.31056	0.14319	0.31250	0.19148	0.31522
0.25	0.00	0.38268	0.04621	0.38316	0.09254	0.38460	0.13910	0.38700	0.18601	0.39036
0.3	0.00	0.45399	0.04457	0.45454	0.08925	0.45626	0.13415	0.45911	0.17939	0.46310
0.35	0.00	0.52250	0.04265	0.52313	0.08541	0.52511	0.12838	0.52839	0.17167	0.53298
0.4	0.00	0.58778	0.04047	0.58850	0.08104	0.59073	0.12181	0.59441	c.16288	0.59958
0.45	0.00	0.64944	0.03804	0.65023	0.07617	0.65270	0.11449	0.65677	0.15310	0.66248
0.5	0.00	0.70711	0.03537	0.70796	0.07083	0.71065	0.10646	0.71508	0.14237	0.72130
0.55	0.00	0.76041	0.03249	0.76133	0.06505	0.76421	0.09778	0.76898	0.13076	0.77567
0.6	0.00	0.80902	0.02940	0.81000	0.05888	0.81307	0.08850	0.81814	0.11834	0.82525
0.65	0.00	0.85264	0.02614	0.85367	0.05234	0.85691	0.07867	0.86225	0.10520	0.86975
0.7	0.00	0.89101	0.02271	0.89208	0.04547	0.89547	0.06835	0.90105	0.09141	0.90889
0.75	0.00	0.92388	0.01914	0.92503	0.03833	0.92850	0.05762	0.93429	0.07705	0.94242
0.8	0.00	0.95106	0.01546	0.95225	0.03095	0.95582	0.04653	0.96178	0.06222	0.97014
0.85	0.00	0.97237	0.01168	0.97359	0.02338	0.97724	0.03515	0.98333	0.04700	0.99188
0.9	0.00	0.98769	0.00783	0.98892	0.01567	0.99263	0.02355	0.99882	0.03150	1.00751
0.95	0.00	0.99692	0.00392	0.99816	0.00786	1.00191	0.01181	1.00815	0.01580	1.01692
1.0	0.00	1.00000	**0.00**	1.00125	**0.00**	1.00500	**0.00**	1.01127	**0.00**	1.02007
1.05	0.00	0.99692	**0.00392**	0.99816	**0.00786**	1.00191	**0.01181**	1.00815	**0.01580**	1.01692
1.1	0.00	0.98769	**0.00783**	0.98892	**0.01567**	0.99263	**0.02355**	0.99882	**0.03150**	1.00751
1.15	0.00	0.97237	**0.01168**	0.97359	**0.02338**	0.97724	**0.03515**	0.98333	**0.04700**	0.99188
1.2	0.00	0.95106	**0.01546**	0.95225	**0.03095**	0.95582	**0.04653**	0.96178	**0.06222**	0.97014
1.25	0.00	0.92388	**0.01914**	0.92503	**0.03833**	0.92850	**0.05762**	0.93429	**0.07705**	0.94242
1.3	0.00	0.89101	**0.02271**	0.89208	**0.04547**	0.89547	**0.06835**	0.90105	**0.09141**	0.90889
1.35	0.00	0.85264	**0.02614**	0.85367	**0.05234**	0.85691	**0.07867**	0.86225	**0.10520**	0.86975
1.4	0.00	0.80902	**0.02940**	0.81000	**0.05888**	0.81307	**0.08850**	0.81814	**0.11834**	0.82525
1.45	0.00	0.76041	**0.03249**	0.76133	**0.06505**	0.76421	**0.09778**	0.76898	**0.13076**	0.77567
1.5	0.00	0.70711	**0.03537**	0.70796	**0.07083**	0.71065	**0.10646**	0.71508	**0.14237**	0.72130
1.55	0.00	0.64944	**0.03804**	0.65023	**0.07617**	0.65270	**0.11449**	0.65677	**0.15310**	0.66248
1.6	0.00	0.58778	**0.04047**	0.58850	**0.08104**	0.59073	**0.12181**	0.59441	**0.16288**	0.59958
1.65	0.00	0.52250	**0.04265**	0.52313	**0.08541**	0.52511	**0.12838**	0.52839	**0.17167**	0.53298
1.7	0.00	0.45399	**0.04457**	0.45454	**0.08925**	0.45626	**0.13415**	0.45911	**0.17939**	0.46310
1.75	0.00	0.38268	**0.04621**	0.38316	**0.09254**	0.38460	**0.13910**	0.38700	**0.18601**	0.39036
1.80	0.00	0.30902	**0.04757**	0.30940	**0.09526**	0.31056	**0.14319**	0.31250	**0.19148**	0.31522
1.85	0.00	0.23345	**0.04864**	0.23374	**0.09740**	0.23461	**0.14640**	0.23608	**0.19577**	0.23813
1.9	0.00	0.15643	**0.04945**	0.15663	**0.09893**	0.15722	**0.14871**	0.15820	**0.19886**	0.15957
1.95	0.00	0.07845	**0.04987**	0.07856	**0.09986**	0.07885	**0.15010**	0.07934	**0.20072**	0.08003
2.0	0.00	0.00	**0.05002**	0.00	**0.10017**	0.00	**0.15056**	0.00	**0.20134**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(0.1 + i\,\underline{0.5}) = 0.07083 + i\,0.71065.$
$\sinh(0.1 + i\,\underline{1.2}) = -0.03095 + i\,0.95582.$

q	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
0	0.25261	0.00	0.30452	0.00	0.35719	0.00	0.41075	0.00	0.46534	0.00
0.05	0.25183	0.08092	0.30358	0.08202	0.35609	0.08331	0.40949	0.08482	0.46391	0.08654
0.1	0.24950	0.16135	0.30077	0.16353	0.35279	0.16611	0.40570	0.16912	0.45961	0.17254
0.15	0.24563	0.24078	0.29611	0.24403	0.34732	0.24789	0.39940	0.25237	0.45249	0.25748
0.2	0.24025	0.31872	0.28962	0.32303	0.33971	0.32814	0.39065	0.33407	0.44257	0.34084
0.25	0.23338	0.39471	0.28134	0.40003	0.33000	0.40636	0.37949	0.41371	0.42992	0.42209
0.3	0.22508	0.46825	0.27133	0.47457	0.31826	0.48208	0.36598	0.49080	0.41462	0.50074
0.35	0.21539	0.53891	0.25965	0.54619	0.30455	0.55483	0.35022	0.56486	0.39677	0.57630
0.4	0.20437	0.60625	0.24636	0.61444	0.28897	0.62416	0.33231	0.63544	0.37647	0.64831
0.45	0.19208	0.66985	0.23156	0.67889	0.27161	0.68964	0.31234	0.70210	0.35385	0.71632
0.5	0.17862	0.72932	0.21533	0.73917	0.25257	0.75086	0.29045	0.76443	0.32905	0.77992
0.55	0.16406	0.78429	0.19777	0.79488	0.23198	0.80746	0.26676	0.82206	0.30222	0.83871
0.6	0.14848	0.83443	0.17899	0.84570	0.20995	0.85908	0.24143	0.87461	0.27352	0.89232
0.65	0.13199	0.87942	0.15911	0.89130	0.18663	0.90540	0.21462	0.92177	0.24314	0.94044
0.7	0.11468	0.91900	0.13825	0.93140	0.16216	0.94614	0.18648	0.96324	0.21126	0.98275
0.75	0.09667	0.95290	0.11654	0.96577	0.13669	0.98105	0.15719	0.99878	0.17808	1.01901
0.8	0.07801	0.98093	0.09410	0.99418	0.11038	1.00991	0.12693	1.02816	0.14380	1.04899
0.85	0.05897	1.00292	0.07109	1.01646	0.08338	1.03254	0.09589	1.05120	0.10863	1.07250
0.9	0.03952	1.01871	0.04764	1.03247	0.05588	1.04880	0.06426	1.06776	0.07280	1.08939
0.95	0.01982	1.02823	0.02389	1.04212	0.02803	1.05860	0.03223	1.07774	0.03651	1.09957
1.0	**0.00**	1.03141	**0.00**	1.04534	**0.00**	1.06188	**0.00**	1.08107	**0.00**	1.10297
1.05	**0.01982**	1.02823	**0.02389**	1.04212	**0.02803**	1.05860	**0.03223**	1.07774	**0.03651**	1.09957
1.1	**0.03952**	1.01871	**0.04764**	1.03247	**0.05588**	1.04880	**0.06426**	1.06776	**0.07280**	1.08939
1.15	**0.05897**	1.00292	**0.07109**	1.01646	**0.08338**	1.03254	**0.09589**	1.05120	**0.10863**	1.07250
1.2	**0.07801**	0.98093	**0.09410**	0.99418	**0.11038**	1.00991	**0.12693**	1.02816	**0.14380**	1.04899
1.25	**0.09667**	0.95290	**0.11654**	0.96577	**0.13669**	0.98105	**0.15719**	0.99878	**0.17808**	1.01901
1.3	**0.11468**	0.91900	**0.13825**	0.93140	**0.16216**	0.94614	**0.18648**	0.96324	**0.21126**	0.98275
1.35	**0.13199**	0.87942	**0.15911**	0.89130	**0.18663**	0.90540	**0.21462**	0.92177	**0.24314**	0.94044
1.4	**0.14848**	0.83443	**0.17899**	0.84570	**0.20995**	0.85908	**0.24143**	0.87461	**0.27352**	0.89232
1.45	**0.16406**	0.78429	**0.19777**	0.79488	**0.23198**	0.80746	**0.26676**	0.82206	**0.30222**	0.83871
1.5	**0.17862**	0.72932	**0.21533**	0.73917	**0.25257**	0.75086	**0.29045**	0.76443	**0.32905**	0.77992
1.55	**0.19208**	0.66985	**0.23156**	0.67889	**0.27161**	0.68964	**0.31234**	0.70210	**0.35385**	0.71632
1.6	**0.20437**	0.60625	**0.24636**	0.61444	**0.28897**	0.62416	**0.33231**	0.63544	**0.37647**	0.64831
1.65	**0.21539**	0.53891	**0.25965**	0.54619	**0.30455**	0.55483	**0.35022**	0.56486	**0.39677**	0.57630
1.7	**0.22508**	0.46825	**0.27133**	0.47457	**0.31826**	0.48208	**0.36598**	0.49080	**0.41462**	0.50074
1.75	**0.23338**	0.39471	**0.28134**	0.40003	**0.33000**	0.40636	**0.37949**	0.41371	**0.42992**	0.42209
1.8	**0.24025**	0.31872	**0.28962**	0.32303	**0.33971**	0.32814	**0.39065**	0.33407	**0.44257**	0.34084
1.85	**0.24563**	0.24078	**0.29611**	0.24403	**0.34732**	0.24789	**0.39940**	0.25237	**0.45249**	0.25748
1.9	**0.24950**	0.16135	**0.30077**	0.16353	**0.35279**	0.16611	**0.40570**	0.16912	**0.45961**	0.17254
1.95	**0.25183**	0.08092	**0.30358**	0.08202	**0.35609**	0.08331	**0.40949**	0.08482	**0.46391**	0.08654
2.0	**0.25261**	0.00	**0.30452**	0.00	**0.35719**	0.00	**0.41075**	0.00	**0.46534**	0.00

Note. Negative quantities are in heavy type.

Examples. sinh $(0.4 + i\,0) = 0.41075 + i\,0$.
sinh $(0.4 + i\,\underline{1}) = 0. + i\,1.08107$.

q	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
0	0.52110	0.00	0.57815	0.00	0.63665	0.00	0.69675	0.00	0.75858	0.00
0.05	0.51949	0.08847	0.57637	0.09063	0.63469	0.09301	0.69460	0.09563	0.75625	0.09848
0.1	0.51468	0.17640	0.57103	0.18070	0.62882	0.18545	0.68817	0.19066	0.74925	0.19635
0.15	0.50670	0.26324	0.56218	0.26965	0.61906	0.27674	0.67750	0.28452	0.73763	0.29301
0.2	0.49559	0.34846	0.54986	0.35695	0.60549	0.36633	0.66265	0.37663	0.72146	0.38787
0.25	0.48143	0.43152	0.53414	0.44204	0.58819	0.45366	0.64371	0.46641	0.70084	0.48033
0.3	0.46430	0.51193	0.51514	0.52441	0.56726	0.53819	0.62081	0.55332	0.67590	0.56984
0.35	0.44431	0.58918	0.49296	0.60354	0.54284	0.61940	0.59408	0.63682	0.64680	0.65582
0.40	0.42158	0.66280	0.46773	0.67895	0.51506	0.69680	0.56368	0.71639	0.61371	0.73777
0.45	0.39624	0.73233	0.43963	0.75018	0.48412	0.76990	0.52981	0.79154	0.57683	0.81517
0.5	0.36847	0.79735	0.40882	0.81678	0.45018	0.83825	0.49268	0.86182	0.53640	0.88754
0.55	0.33842	0.85745	0.37548	0.87835	0.41347	0.90144	0.45250	0.92678	0.49266	0.95444
0.6	0.30629	0.91227	0.33983	0.93450	0.37422	0.95906	0.40954	0.98602	0.44589	1.01545
0.65	0.27227	0.96146	0.30208	0.98489	0.33265	1.01078	0.36405	1.03919	0.39636	1.07021
0.7	0.23657	1.00472	0.26248	1.02920	0.28904	1.05626	0.31632	1.08595	0.34439	1.11836
0.75	0.19942	1.04179	0.22125	1.06717	0.24364	1.09523	0.26663	1.12602	0.29030	1.15962
0.8	0.16103	1.07244	0.17866	1.09857	0.19674	1.12744	0.21531	1.15912	0.23442	1.19374
0.85	0.12165	1.09647	0.13497	1.12319	0.14862	1.15271	0.16265	1.18512	0.17709	1.22049
0.9	0.08152	1.11374	0.09044	1.14088	0.09959	1.17087	0.10900	1.20379	0.11867	1.23972
0.95	0.04088	1.12415	0.04536	1.15154	0.04995	1.18181	0.05467	1.21504	0.05952	1.25130
1.0	**0.00**	1.12763	**0.00**	1.15510	**0.00**	1.18547	**0.00**	1.21879	**0.00**	1.25517
1.05	**0.04088**	1.12415	**0.04536**	1.15154	**0.04995**	1.18181	**0.05467**	1.21504	**0.05952**	1.25130
1.1	**0.08152**	1.11374	**0.09044**	1.14088	**0.09959**	1.17087	**0.10900**	1.20379	**0.11867**	1.23972
1.15	**0.12165**	1.09647	**0.13497**	1.12319	**0.14862**	1.15271	**0.16265**	1.18512	**0.17709**	1.22049
1.2	**0.16103**	1.07244	**0.17866**	1.09857	**0.19674**	1.12744	**0.21531**	1.15912	**0.23442**	1.19374
1.25	**0.19942**	1.04179	**0.22125**	1.06717	**0.24364**	1.09523	**0.26663**	1.12602	**0.29030**	1.15962
1.3	**0.23657**	1.00472	**0.26248**	1.02920	**0.28904**	1.05626	**0.31632**	1.08595	**0.34439**	1.11836
1.35	**0.27227**	0.96146	**0.30208**	0.98489	**0.33265**	1.01078	**0.36405**	1.03919	**0.39636**	1.07021
1.4	**0.30629**	0.91227	**0.33983**	0.93450	**0.37422**	0.95906	**0.40954**	0.98602	**0.44589**	1.01545
1.45	**0.33842**	0.85745	**0.37548**	0.87835	**0.41347**	0.90144	**0.45250**	0.92678	**0.49266**	0.95444
1.5	**0.36847**	0.79735	**0.40882**	0.81678	**0.45018**	0.83825	**0.49268**	0.86182	**0.53640**	0.88754
1.55	**0.39624**	0.73233	**0.43963**	0.75018	**0.48412**	0.76990	**0.52981**	0.79154	**0.57683**	0.81517
1.6	**0.42158**	0.66280	**0.46773**	0.67895	**0.51506**	0.69680	**0.56368**	0.71639	**0.61371**	0.73777
1.65	**0.44431**	0.58918	**0.49296**	0.60354	**0.54284**	0.61940	**0.59408**	0.63682	**0.64680**	0.65582
1.7	**0.46430**	0.51193	**0.51514**	0.52441	**0.56726**	0.53819	**0.62081**	0.55332	**0.67590**	0.56984
1.75	**0.48143**	0.43152	**0.53414**	0.44204	**0.58819**	0.45366	**0.64371**	0.46641	**0.70084**	0.48033
1.8	**0.49559**	0.34846	**0.54986**	0.35695	**0.60549**	0.36633	**0.66265**	0.37663	**0.72146**	0.38787
1.85	**0.50670**	0.26324	**0.56218**	0.26965	**0.61906**	0.27674	**0.67750**	0.28452	**0.73763**	0.29301
1.9	**0.51468**	0.17640	**0.57103**	0.18070	**0.62882**	0.18545	**0.68817**	0.19066	**0.74925**	0.19635
1.95	**0.51949**	0.08847	**0.57637**	0.09063	**0.63469**	0.09301	**0.69460**	0.09563	**0.75625**	0.09848
2.0	**0.52110**	0.00	**0.57815**	0.00	**0.63665**	0.00	**0.69675**	0.00	**0.75858**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(0.65 + i\,\underline{0.75}) = 0.26663 + i\,1.12602$.
$\sinh(0.55 + i\,\underline{1.40}) = -0.33983 + i\,0.93450$.

q	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
0	0.82232	0.00	0.88811	0.00	0.95612	0.00	1.02652	0.00	1.09948	0.00
0.05	0.81978	0.10158	0.88537	0.10493	0.95317	0.10855	1.02335	0.11244	1.09610	0.11661
0.1	0.81219	0.20253	0.87717	0.20922	0.94435	0.21643	1.01388	0.22418	1.08595	0.23250
0.15	0.79960	0.30224	0.86357	0.31222	0.92970	0.32298	0.99816	0.33455	1.06911	0.34695
0.2	0.78207	0.40079	0.84464	0.41329	0.90932	0.42753	0.97628	0.44285	1.04567	0.45927
0.25	0.75972	0.49545	0.82050	0.51182	0.88334	0.52945	0.94838	0.54842	1.01579	0.56875
0.3	0.73269	0.58777	0.79131	0.60718	0.85191	0.62811	0.91463	0.65061	0.97965	0.67473
0.35	0.70114	0.67647	0.75724	0.69881	0.81522	0.72289	0.87525	0.74879	0.93747	0.77655
0.4	0.66527	0.76100	0.71849	0.78613	0.77351	0.81322	0.83047	0.84235	0.88950	0.87358
0.45	0.62529	0.84083	0.67532	0.86859	0.72704	0.89853	0.78057	0.93071	0.83605	0.96523
0.5	0.58146	0.91548	0.62799	0.94571	0.67608	0.97830	0.72586	1.01334	0.77745	1.05092
0.55	0.53405	0.98449	0.57678	1.01700	0.62095	1.05205	0.66667	1.08973	0.71406	1.13013
0.6	0.48335	1.04742	0.52202	1.08201	0.56199	1.11930	0.60337	1.15939	0.64621	1.20238
0.65	0.42966	1.10390	0.46403	1.14035	0.49957	1.17965	0.53635	1.22191	0.57448	1.26722
0.7	0.37332	1.15356	0.40319	1.19166	0.43407	1.23274	0.46603	1.27689	0.49916	1.32425
0.75	0.31469	1.19613	0.33986	1.23563	0.36589	1.27822	0.39283	1.32400	0.42076	1.37309
0.8	0.25411	1.23132	0.27444	1.27198	0.29546	1.31582	0.31721	1.36294	0.33976	1.41348
0.85	0.19197	1.25891	0.20732	1.30048	0.22320	1.34530	0.23964	1.39349	0.25667	1.44516
0.9	0.12864	1.27874	0.13893	1.32097	0.14957	1.36650	0.16058	1.41544	0.17200	1.46793
0.95	0.06452	1.29069	0.06968	1.33331	0.07502	1.37927	0.08054	1.42867	0.08627	1.48164
1.0	**0.00**	1.29468	**0.00**	1.33743	**0.00**	1.38353	**0.00**	1.43309	**0.00**	1.48623
1.05	**0.06452**	1.29069	**0.06968**	1.33331	**0.07502**	1.37927	**0.08054**	1.42867	**0.08627**	1.48164
1.1	**0.12864**	1.27874	**0.13893**	1.32097	**0.14957**	1.36650	**0.16058**	1.41544	**0.17200**	1.46793
1.15	**0.19197**	1.25891	**0.20732**	1.30048	**0.22320**	1.34530	**0.23964**	1.39349	**0.25667**	1.44516
1.2	**0.25411**	1.23132	**0.27444**	1.27198	**0.29546**	1.31582	**0.31721**	1.36294	**0.33976**	1.41348
1.25	**0.31469**	1.19613	**0.33986**	1.23563	**0.36589**	1.27822	**0.39283**	1.32400	**0.42076**	1.37309
1.3	**0.37332**	1.15356	**0.40319**	1.19166	**0.43407**	1.23274	**0.46603**	1.27689	**0.49916**	1.32425
1.35	**0.42966**	1.10390	**0.46403**	1.14035	**0.49957**	1.17965	**0.53635**	1.22191	**0.57448**	1.26722
1.4	**0.48335**	1.04742	**0.52202**	1.08201	**0.56199**	1.11930	**0.60337**	1.15939	**0.64621**	1.20238
1.45	**0.53405**	0.98449	**0.57678**	1.01700	**0.62095**	1.05205	**0.66667**	1.08973	**0.71406**	1.13013
1.5	**0.58146**	0.91548	**0.62799**	0.94571	**0.67608**	0.97830	**0.72586**	1.01334	**0.77745**	1.05092
1.55	**0.62529**	0.84083	**0.67532**	0.86859	**0.72704**	0.89853	**0.78057**	0.93071	**0.83605**	0.96523
1.6	**0.66527**	0.76100	**0.71849**	0.78613	**0.77351**	0.81322	**0.83047**	0.84235	**0.88950**	0.87358
1.65	**0.70114**	0.67647	**0.75724**	0.69881	**0.81522**	0.72289	**0.87525**	0.74879	**0.93747**	0.77655
1.7	**0.73269**	0.58777	**0.79131**	0.60718	**0.85191**	0.62811	**0.91463**	0.65061	**0.97965**	0.67473
1.75	**0.75972**	0.49545	**0.82050**	0.51182	**0.88334**	0.52945	**0.94838**	0.54842	**1.01579**	0.56875
1.8	**0.78207**	0.40079	**0.84464**	0.41329	**0.90932**	0.42753	**0.97628**	0.44285	**1.04567**	0.45927
1.85	**0.79960**	0.30224	**0.86357**	0.31222	**0.92970**	0.32298	**0.99816**	0.33455	**1.06911**	0.34695
1.9	**0.81219**	0.20253	**0.87717**	0.20922	**0.94435**	0.21643	**1.01388**	0.22418	**1.08595**	0.23250
1.95	**0.81978**	0.10158	**0.88537**	0.10493	**0.95317**	0.10855	**1.02335**	0.11244	**1.09610**	0.11661
2.0	**0.82232**	0.00	**0.88811**	0.00	**0.95612**	0.00	**1.02652**	0.00	**1.09948**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(0.8 + i\,\underline{0.7}) = 0.40319 + i\,1.19166.$
$\sinh(0.8 + i\,\underline{1.7}) = -0.79131 + i\,0.60718.$

q	$x = 1.0$		$x = 1.05$		$x = 1.1$		$x = 1.15$		$x = 1.2$	
0	1.17520	0.00	1.25386	0.00	1.33565	0.00	1.42078	0.00	1.50946	0.00
0.05	1.17158	0.12107	1.24999	0.12583	1.33153	0.13091	1.41640	0.13632	1.50481	0.14206
0.1	1.16073	0.24139	1.23842	0.25089	1.31920	0.26101	1.40329	0.27179	1.49088	0.28325
0.15	1.14273	0.36023	1.21921	0.37440	1.29875	0.38951	1.38152	0.40559	1.46776	0.42269
0.2	1.11768	0.47684	1.19249	0.49560	1.27028	0.51560	1.35124	0.53689	1.43558	0.55952
0.25	1.08574	0.59051	1.15841	0.61375	1.23398	0.63852	1.31263	0.66488	1.39456	0.69291
0.3	1.04711	0.70055	1.11719	0.72811	1.19007	0.75749	1.26592	0.78877	1.34494	0.82202
0.35	1.00202	0.80626	1.06909	0.83798	1.13883	0.87180	1.21141	0.90780	1.28703	0.94607
0.4	0.95076	0.90700	1.01439	0.94269	1.08056	0.98073	1.14943	1.02123	1.22118	1.06428
0.45	0.89363	1.00215	0.95344	1.04158	1.01564	1.08362	1.08037	1.12836	1.14781	1.71593
0.5	0.83099	1.09112	0.88661	1.13405	0.94445	1.17982	1.00464	1.22854	1.06735	1.28033
0.55	0.76323	1.17337	0.81432	1.21953	0.86743	1.26875	0.92272	1.32114	0.98032	1.37684
0.6	0.69077	1.24838	0.73700	1.29750	0.78508	1.34986	0.83511	1.40560	0.88724	1.46485
0.65	0.61404	1.31569	0.65514	1.36746	0.69787	1.42265	0.74235	1.48139	0.78869	1.54384
0.7	0.53353	1.37490	0.56924	1.42899	0.60637	1.48666	0.64502	1.54805	0.68528	1.61331
0.75	0.44973	1.42562	0.47983	1.48171	0.51113	1.54151	0.54371	1.60517	0.57765	1.67283
0.8	0.36316	1.46756	0.38746	1.52530	0.41274	1.58685	0.43904	1.65238	0.46645	1.72204
0.85	0.27435	1.50045	0.29271	1.55948	0.31180	1.62242	0.33167	1.68941	0.35238	1.76063
0.9	0.18384	1.52408	0.19615	1.58405	0.20894	1.64798	0.22226	1.71602	0.23613	1.78836
0.95	0.09221	1.53832	0.09838	1.59885	0.10479	1.66337	0.11147	1.73206	0.11843	1.80507
1.0	0.00	1.54308	0.00	1.60379	0.00	1.66852	0.00	1.73741	0.00	1.81066
1.05	**0.09221**	1.53832	**0.09838**	1.59885	**0.10479**	1.66337	**0.11147**	1.73206	**0.11843**	1.80507
1.1	**0.18384**	1.52408	**0.19615**	1.58405	**0.20894**	1.64798	**0.22226**	1.71602	**0.23613**	1.78836
1.15	**0.27435**	1.50045	**0.29271**	1.55948	**0.31180**	1.62242	**0.33167**	1.68941	**0.35238**	1.76063
1.2	**0.36316**	1.46756	**0.38746**	1.52530	**0.41274**	1.58685	**0.43904**	1.65238	**0.46645**	1.72204
1.25	**0.44973**	1.42562	**0.47983**	1.48171	**0.51113**	1.54151	**0.54371**	1.60517	**0.57765**	1.67283
1.3	**0.53353**	1.37490	**0.56924**	1.42899	**0.60637**	1.48666	**0.64502**	1.54805	**0.68528**	1.61331
1.35	**0.61404**	1.31569	**0.65514**	1.36746	**0.69787**	1.42265	**0.74235**	1.48139	**0.78869**	1.54384
1.4	**0.69077**	1.24838	**0.73700**	1.29750	**0.78508**	1.34986	**0.83511**	1.40560	**0.88724**	1.46485
1.45	**0.76323**	1.17337	**0.81432**	1.21953	**0.86743**	1.26875	**0.92272**	1.32114	**0.98032**	1.37684
1.5	**0.83099**	1.09112	**0.88661**	1.13405	**0.94445**	1.17982	**1.00464**	1.22854	**1.06735**	1.28033
1.55	**0.89363**	1.00215	**0.95344**	1.04158	**1.01564**	1.08362	**1.08037**	1.12836	**1.14781**	1.17593
1.6	**0.95076**	0.90700	**1.01439**	0.94269	**1.08056**	0.98073	**1.14943**	1.02123	**1.22118**	1.06428
1.65	**1.00202**	0.80626	**1.06909**	0.83798	**1.13883**	0.87180	**1.21141**	0.90780	**1.28703**	0.94607
1.7	**1.04711**	0.70055	**1.11719**	0.72811	**1.19007**	0.75749	**1.26592**	0.78877	**1.34494**	0.82202
1.75	**1.08574**	0.59051	**1.15841**	0.61375	**1.23398**	0.63852	**1.31263**	0.66488	**1.39456**	0.69291
1.8	**1.11768**	0.47684	**1.19249**	0.49560	**1.27028**	0.51560	**1.35124**	0.53689	**1.43558**	0.55952
1.85	**1.14273**	0.36023	**1.21921**	0.37440	**1.29875**	0.38951	**1.38152**	0.40559	**1.46776**	0.42269
1.9	**1.16073**	0.24139	**1.23842**	0.25089	**1.31920**	0.26101	**1.40329**	0.27179	**1.49088**	0.28325
1.95	**1.17158**	0.12107	**1.24999**	0.12583	**1.33153**	0.13091	**1.41640**	0.13632	**1.50481**	0.14206
2.0	**1.17520**	0.00	**1.25386**	0.00	**1.33565**	0.00	**1.42078**	0.00	**1.50946**	0.00

Note. Negative quantities are in heavy type.

Examples. sinh $(1.0 + i\,\underline{1.0}) = 0 + i\,1.54308$.
sinh $(1.0 + i\,\underline{1.5}) = -0.83099 + i\,1.09112$.

q	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
0	1.60192	0.00	1.69838	0.00	1.79909	0.00	1.90430	0.00	2.01427	0.00
0.05	1.59698	0.14816	1.69315	0.15464	1.79354	0.16150	1.89843	0.16876	2.00806	0.17644
0.1	1.58220	0.29541	1.67747	0.30832	1.77694	0.32199	1.88086	0.33647	1.98947	0.35180
0.15	1.55766	0.44084	1.65146	0.46010	1.74938	0.48051	1.85169	0.50212	1.95862	0.52498
0.2	1.52352	0.58355	1.61526	0.60905	1.71104	0.63606	1.81110	0.66466	1.91569	0.69493
0.25	1.47998	0.72267	1.56910	0.75424	1.66215	0.78769	1.75934	0.82311	1.86094	0.86060
0.3	1.42732	0.85733	1.51327	0.89478	1.60300	0.93446	1.69675	0.97649	1.79473	1.02095
0.35	1.36586	0.98670	1.44811	1.02980	1.53398	1.07548	1.62369	1.12384	1.71745	1.17502
0.4	1.29598	1.10999	1.37402	1.15848	1.45550	1.20986	1.54061	1.26427	1.62958	1.32184
0.45	1.21811	1.22643	1.29146	1.28001	1.36804	1.33678	1.44804	1.39690	1.53166	1.46051
0.5	1.13273	1.33532	1.20094	1.39365	1.27215	1.45546	1.34655	1.52092	1.42431	1.59017
0.55	1.04036	1.43597	1.10301	1.49870	1.16842	1.56517	1.23674	1.63556	1.30817	1.71007
0.6	0.94158	1.52777	0.99829	1.59451	1.05748	1.66523	1.11932	1.74012	1.18396	1.81935
0.65	0.83700	1.61014	0.88740	1.68048	0.94002	1.75502	0.99500	1.83394	1.05245	1.91745
0.7	0.72726	1.68260	0.77105	1.75610	0.81677	1.83399	0.86454	1.91646	0.91446	2.00373
0.75	0.61303	1.74467	0.64994	1.82089	0.68848	1.90165	0.72875	1.98717	0.77083	2.07766
0.8	0.49502	1.79600	0.52483	1.87445	0.55595	1.95759	0.58846	2.04562	0.62244	2.13878
0.85	0.37396	1.83624	0.39648	1.91646	0.41999	2.00146	0.44455	2.09147	0.47022	2.18671
0.9	0.25060	1.86517	0.26569	1.94665	0.28144	2.03299	0.29790	2.12442	0.31510	2.22115
0.95	0.12569	1.88260	0.13325	1.96484	0.14116	2.05199	0.14427	2.14427	0.15804	2.24191
1.0	**0.00**	1.88842	**0.00**	1.97091	**0.00**	2.05833	**0.00**	2.15090	**0.00**	2.24884
1.05	**0.12569**	1.88260	**0.13325**	1.96484	**0.14116**	2.05199	**0.14427**	2.14427	**0.15804**	2.24191
1.1	**0.25060**	1.86517	**0.26569**	1.94665	**0.28144**	2.03299	**0.29790**	2.12442	**0.31510**	2.22115
1.15	**0.37396**	1.83624	**0.39648**	1.91646	**0.41999**	2.00146	**0.44455**	2.09147	**0.47022**	2.18671
1.2	**0.49502**	1.79600	**0.52483**	1.87445	**0.55595**	1.95759	**0.58846**	2.04562	**0.62244**	2.13878
1.25	**0.61303**	1.74467	**0.64994**	1.82089	**0.68848**	1.90165	**0.72875**	1.98717	**0.77083**	2.07766
1.3	**0.72726**	1.68260	**0.77105**	1.75610	**0.81677**	1.83399	**0.86454**	1.91646	**0.91446**	2.00373
1.35	**0.83700**	1.61014	**0.88740**	1.68048	**0.94002**	1.75502	**0.99500**	1.83394	**1.05245**	1.91745
1.4	**0.94158**	1.52777	**0.99829**	1.59451	**1.05748**	1.66523	**1.11932**	1.74012	**1.18396**	1.81935
1.45	**1.04036**	1.43597	**1.10301**	1.49870	**1.16842**	1.56517	**1.23674**	1.63556	**1.30817**	1.71007
1.5	**1.13273**	1.33532	**1.20094**	1.39365	**1.27215**	1.45546	**1.34655**	1.52092	**1.42431**	1.59017
1.55	**1.21811**	1.22643	**1.29146**	1.28001	**1.36804**	1.33678	**1.44804**	1.39690	**1.53166**	1.46051
1.6	**1.29598**	1.10999	**1.37402**	1.15848	**1.45550**	1.20986	**1.54061**	1.26427	**1.62958**	1.32184
1.65	**1.36586**	0.98670	**1.44811**	1.02980	**1.53398**	1.07548	**1.62369**	1.12384	**1.71745**	1.17502
1.7	**1.42732**	0.85733	**1.51327**	0.89478	**1.60300**	0.93446	**1.69675**	0.97649	**1.79473**	1.02095
1.75	**1.47998**	0.72267	**1.56910**	0.75424	**1.66215**	0.78769	**1.75934**	0.82311	**1.86094**	0.86060
1.8	**1.52352**	0.58355	**1.61526**	0.60905	**1.71104**	0.63606	**1.81110**	0.66466	**1.91569**	0.69493
1.85	**1.55766**	0.44084	**1.65146**	0.46010	**1.74938**	0.48051	**1.85169**	0.50212	**1.95862**	0.52498
1.9	**1.58220**	0.29541	**1.67747**	0.30832	**1.77694**	0.32199	**1.88086**	0.33647	**1.98947**	0.35180
1.95	**1.59698**	0.14816	**1.69315**	0.15464	**1.79354**	0.16150	**1.89843**	0.16876	**2.00806**	0.17644
2.0	**1.60192**	0.00	**1.69838**	0.00	**1.79909**	0.00	**1.90430**	0.00	**2.01427**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh (1.35 + i\,0) = 1.70909 + i\,0.$
$\sinh (1.4 + i\,\underline{1.15}) = -0.44455 + i\,2.09147.$

q	$x = 1.5$		$x = 1.55$		$x = 1.6$		$x = 1.65$		$x = 1.7$	
0	2.12928	0.00	2.24961	0.00	2.37557	0.00	2.50746	0.00	2.64563	0.00
0.05	2.12272	0.18457	2.24268	0.19316	2.36824	0.20223	2.49973	0.21180	2.63747	0.22191
0.1	2.10307	0.36800	2.22191	0.38512	2.34632	0.40320	2.47659	0.42230	2.61306	0.44245
0.15	2.07045	0.54916	2.18745	0.57471	2.30993	0.60170	2.43818	0.63019	2.57253	0.66026
0.2	2.02507	0.72693	2.13951	0.76076	2.25930	0.79648	2.38474	0.83420	2.51614	0.87400
0.25	1.96720	0.90023	2.07837	0.94211	2.19473	0.98636	2.31660	1.03306	2.44424	1.08235
0.3	1.89720	1.06797	2.00442	1.11766	2.11664	1.17015	2.23417	1.22556	2.35727	1.28403
0.35	1.81551	1.22913	1.91811	1.28632	2.02550	1.34672	2.13797	1.41050	2.25577	1.47779
0.4	1.72263	1.38271	1.81997	1.44704	1.92187	1.51500	2.02858	1.58674	2.14036	1.66244
0.45	1.61912	1.52777	1.71062	1.59885	1.80640	1.67393	1.90669	1.75320	2.01175	1.83684
0.5	1.50563	1.66341	1.59071	1.74080	1.67978	1.82254	1.77305	1.90885	1.87074	1.99992
0.55	1.38286	1.78879	1.46101	1.87201	1.54281	1.95992	1.62847	2.05274	1.71820	2.15067
0.6	1.25156	1.90314	1.32229	1.99169	1.39632	2.08522	1.47385	2.18396	1.55506	2.28816
0.65	1.11255	2.00576	1.17542	2.09908	1.24123	2.19765	1.31015	2.30173	1.38234	2.41154
0.7	0.96667	2.09601	1.02130	2.19353	1.07848	2.29654	1.13837	2.40529	1.20109	2.52005
0.75	0.81484	2.17334	0.86089	2.27446	0.90909	2.38127	0.95957	2.49404	1.01244	2.61302
0.8	0.65798	2.23727	0.69517	2.34137	0.73409	2.45131	0.77485	2.56740	0.81754	2.68989
0.85	0.49707	2.28742	0.52516	2.39384	0.55456	2.50625	0.58536	2.62494	0.61761	2.75017
0.9	0.33309	2.32345	0.35192	2.43155	0.37163	2.54573	0.39225	2.66629	0.41387	2.79350
0.95	0.16706	2.34516	0.17650	2.45427	0.18639	2.56952	0.19673	2.69121	0.20757	2.81960
1.0	**0.00**	2.35241	**0.00**	2.46186	**0.00**	2.57746	**0.00**	2.69951	**0.00**	2.82832
1.05	**0.16706**	2.34516	**0.17650**	2.45427	**0.18639**	2.56952	**0.19673**	2.69121	**0.20757**	2.81960
1.1	**0.33309**	2.32345	**0.35192**	2.43155	**0.37163**	2.54573	**0.39225**	2.66629	**0.41387**	2.79350
1.15	**0.49707**	2.28742	**0.52516**	2.39384	**0.55456**	2.50625	**0.58536**	2.62494	**0.61761**	2.75017
1.2	**0.65798**	2.23727	**0.69517**	2.34137	**0.73409**	2.45131	**0.77485**	2.56740	**0.81754**	2.68989
1.25	**0.81484**	2.17334	**0.86089**	2.27446	**0.90909**	2.38127	**0.95957**	2.49404	**1.01244**	2.61302
1.3	**0.96667**	2.09601	**1.02130**	2.19353	**1.07848**	2.29654	**1.13837**	2.40529	**1.20109**	2.52005
1.35	**1.11255**	2.00576	**1.17542**	2.09908	**1.24123**	2.19765	**1.31015**	2.30173	**1.38234**	2.41154
1.4	**1.25156**	1.90314	**1.32229**	1.99169	**1.39632**	2.08522	**1.47385**	2.18396	**1.55506**	2.28816
1.45	**1.38286**	1.78879	**1.46101**	1.87201	**1.54281**	1.95992	**1.62847**	2.05274	**1.71820**	2.15067
1.5	**1.50563**	1.66341	**1.59071**	1.74080	**1.67978**	1.82254	**1.77305**	1.90885	**1.87074**	1.99992
1.55	**1.61912**	1.52777	**1.71062**	1.59885	**1.80640**	1.67393	**1.90669**	1.75320	**2.01175**	1.83684
1.6	**1.72263**	1.38271	**1.81997**	1.44704	**1.92187**	1.51500	**2.02858**	1.58674	**2.14036**	1.66244
1.65	**1.81551**	1.22913	**1.91811**	1.28632	**2.02550**	1.34672	**2.13797**	1.41050	**2.25577**	1.47779
1.7	**1.89720**	1.06797	**2.00442**	1.11766	**2.11664**	1.17015	**2.23417**	1.22556	**2.35727**	1.28403
1.75	**1.96720**	0.90023	**2.07837**	0.94211	**2.19473**	0.98636	**2.31660**	1.03306	**2.44424**	1.08235
1.8	**2.02507**	0.72693	**2.13951**	0.76076	**2.25930**	0.79648	**2.38474**	0.83420	**2.51614**	0.87400
1.85	**2.07045**	0.54916	**2.18745**	0.57471	**2.30993**	0.60170	**2.43818**	0.63019	**2.57253**	0.66026
1.9	**2.10307**	0.36800	**2.22191**	0.38512	**2.34632**	0.40320	**2.47659**	0.42230	**2.61306**	0.44245
1.95	**2.12272**	0.18457	**2.24268**	0.19316	**2.36824**	0.20223	**2.49973**	0.21180	**2.63747**	0.22191
2.0	**2.12928**	0.00	**2.24961**	0.00	**2.37557**	0.00	**2.50746**	0.00	**2.64563**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(1.7 + i\,\underline{0.7}) = 1.20109 + i\,2.52005$.
$\sinh(1.7 + i\,\underline{1.7}) = -2.35727 + i\,1.28403$.

q	$x = 1.75$		$x = 1.8$		$x = 1.85$		$x = 1.9$		$x = 1.95$	
0	2.79041	0.00	2.94217	0.00	3.10129	0.00	3.26816	0.00	3.44321	0.00
0.05	2.78181	0.23257	2.93310	0.24381	3.09173	0.25566	3.25809	0.26815	3.43259	0.28131
0.1	2.75606	0.46370	2.90595	0.48612	3.06311	0.50975	3.22793	0.53465	3.40081	0.56089
0.15	2.71331	0.69198	2.86088	0.72542	3.01560	0.76069	3.17787	0.79785	3.34807	0.83701
0.2	2.65384	0.91599	2.79817	0.96026	2.94950	1.00694	3.10821	1.05614	3.27468	1.10797
0.25	2.57800	1.13435	2.71821	1.18918	2.86522	1.24698	3.01939	1.30791	3.18111	1.37210
0.3	2.48627	1.34571	2.62149	1.41076	2.76327	1.47934	2.91196	1.55162	3.06792	1.62777
0.35	2.37922	1.54878	2.50862	1.62365	2.64429	1.70258	2.78657	1.78576	2.93582	1.87341
0.4	2.25749	1.74231	2.38027	1.82653	2.50900	1.91531	2.64400	2.00889	2.78561	2.10749
0.45	2.12185	1.92509	2.23725	2.01814	2.35824	2.11624	2.48513	2.21964	2.61823	2.32858
0.5	1.97312	2.09600	2.08043	2.19731	2.19294	2.30413	2.31094	2.41670	2.43471	2.53532
0.55	1.81223	2.25399	1.91079	2.36294	2.01413	2.47780	2.12250	2.59887	2.23618	2.72642
0.6	1.64016	2.39808	1.72937	2.51400	1.82289	2.63620	1.92098	2.76501	2.02387	2.90071
0.65	1.45799	2.52739	1.53728	2.64956	1.62042	2.77835	1.70761	2.91409	1.79907	3.05713
0.7	1.26682	2.64111	1.33572	2.76878	1.40796	2.90337	1.48372	3.04522	1.56318	3.19469
0.75	1.06784	2.73855	1.12592	2.87093	1.18681	3.01049	1.25067	3.15757	1.31766	3.31255
0.8	0.86229	2.81911	0.90918	2.95538	0.95835	3.09904	1.00992	3.25045	1.06401	3.41000
0.85	0.65141	2.88229	0.68684	3.02161	0.72398	3.16850	0.76294	3.32330	0.80380	3.48641
0.9	0.43652	2.92769	0.46026	3.06921	0.48627	3.21841	0.51125	3.37565	0.53864	3.54134
0.95	0.21893	2.95505	0.23084	3.09789	0.24332	3.24848	0.25642	3.40719	0.27015	3.57443
1.0	**0.00**	2.96419	**0.00**	3.10747	**0.00**	3.25853	**0.00**	3.41773	**0.00**	3.58548
1.05	**0.21893**	2.95505	**0.23084**	3.09789	**0.24332**	3.24848	**0.25642**	3.40719	**0.27015**	3.57443
1.1	**0.43652**	2.92769	**0.46026**	3.06921	**0.48627**	3.21841	**0.51125**	3.37565	**0.53864**	3.54134
1.15	**0.65141**	2.88229	**0.68684**	3.02161	**0.72398**	3.16850	**0.76294**	3.32330	**0.80380**	3.48641
1.2	**0.86229**	2.81911	**0.90918**	2.95538	**0.95835**	3.09904	**1.00992**	3.25045	**1.06401**	3.41000
1.25	**1.06784**	2.73855	**1.12592**	2.87093	**1.18681**	3.01049	**1.25067**	3.15757	**1.31766**	3.31255
1.3	**1.26682**	2.64111	**1.33572**	2.76878	**1.40796**	2.90337	**1.48372**	3.04522	**1.56318**	3.19469
1.35	**1.45799**	2.52739	**1.53728**	2.64956	**1.62042**	2.77835	**1.70761**	2.91409	**1.79907**	3.05713
1.4	**1.64016**	2.39808	**1.72937**	2.51400	**1.82289**	2.63620	**1.92098**	2.76501	**2.02387**	2.90071
1.45	**1.81223**	2.25399	**1.91079**	2.36294	**2.01413**	2.47780	**2.12250**	2.59887	**2.23618**	2.72642
1.5	**1.97312**	2.09600	**2.08043**	2.19731	**2.19294**	2.30413	**2.31094**	2.41670	**2.43471**	2.53532
1.55	**2.12185**	1.92509	**2.23725**	2.01814	**2.35824**	2.11624	**2.48513**	2.21964	**2.61823**	2.32858
1.6	**2.25749**	1.74231	**2.38027**	1.82653	**2.50900**	1.91531	**2.64400**	2.00889	**2.78561**	2.10749
1.65	**2.37922**	1.54878	**2.50862**	1.62365	**2.64429**	1.70258	**2.78657**	1.78576	**2.93582**	1.87341
1.7	**2.48627**	1.34571	**2.62149**	1.41076	**2.76327**	1.47934	**2.91196**	1.55162	**3.06792**	1.62777
1.75	**2.57800**	1.13435	**2.71821**	1.18918	**2.86522**	1.24698	**3.01939**	1.30791	**3.18111**	1.37210
1.8	**2.65384**	0.91599	**2.79817**	0.96026	**2.94950**	1.00694	**3.10821**	1.05614	**3.27468**	1.10797
1.85	**2.71331**	0.69198	**2.86088**	0.72542	**3.01560**	0.76069	**3.17787**	0.79785	**3.34807**	0.83701
1.9	**2.75606**	0.46370	**2.90595**	0.48612	**3.06311**	0.50975	**3.22793**	0.53465	**3.40081**	0.56089
1.95	**2.78181**	0.23257	**2.93310**	0.24381	**3.09173**	0.25566	**3.25809**	0.26815	**3.43259**	0.28131
2.0	**2.79041**	0.00	**2.94217**	0.00	**3.10129**	0.00	**3.26816**	0.00	**3.44321**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(1.85 + i\,\underline{0.75}) = 1.18681 + i\,3.01049$.
$\sinh(1.85 + i\,\underline{1.35}) = -1.62042 + i\,2.77835$.

Table VII. HYPERBOLIC SINES. $\sinh(x + iq) = u + iv$. Continued

q	$x = 2.0$		$x = 2.05$		$x = 2.1$		$x = 2.15$		$x = 2.2$	
0	3.62686	0.00	3.81958	0.00	4.02186	0.00	4.23419	0.00	4.45711	0.00
0.05	3.61568	0.29518	3.80781	0.30978	4.00946	0.32516	4.22113	0.34135	4.44337	0.35839
0.1	3.58221	0.58854	3.77256	0.61765	3.97235	0.64831	4.18206	0.68060	4.40223	0.71458
0.15	3.52666	0.87827	3.71404	0.92172	3.91074	0.96747	4.11720	1.01564	4.33396	1.06636
0.2	3.44935	1.16258	3.63264	1.22010	3.82501	1.28066	4.02695	1.34443	4.23896	1.41156
0.25	3.35078	1.43973	3.52883	1.51096	3.71571	1.58596	3.91188	1.66493	4.11783	1.74806
0.3	3.23156	1.70800	3.40327	1.79250	3.58351	1.88148	3.77269	1.97516	3.97131	2.07379
0.35	3.09241	1.96574	3.23673	2.06299	3.42920	2.16540	3.61024	2.27322	3.80031	2.38672
0.4	2.93420	2.21136	3.09011	2.32076	3.25376	2.43597	3.42553	2.55726	3.60588	2.68495
0.45	2.75789	2.44335	2.90443	2.56423	3.05825	2.69152	3.21970	2.82553	3.38921	2.96661
0.5	2.56458	2.66027	2.70085	2.79188	2.84389	2.93048	2.99402	3.07639	3.15165	3.23000
0.55	2.35546	2.86080	2.48062	3.00232	2.61199	3.15137	2.74988	3.30828	2.89466	3.47347
0.6	2.13182	3.04368	2.24509	3.19426	2.36399	3.35283	2.48879	3.51977	2.61982	3.69552
0.65	1.89503	3.20780	1.99573	3.36649	2.10142	3.53361	2.21236	3.70956	2.32883	3.89478
0.7	1.64656	3.35214	1.73405	3.51798	1.82589	3.69261	1.92228	3.87647	2.02349	4.07003
0.75	1.38794	3.47581	1.46169	3.64777	1.53910	3.82885	1.62035	4.01950	1.70566	4.22019
0.8	1.12076	3.57806	1.18032	3.75507	1.24282	3.94148	1.30844	4.13773	1.37732	4.34433
0.85	0.84667	3.65825	0.89166	3.83923	0.93888	4.02981	0.98845	4.23046	1.04049	4.44170
0.9	0.56737	3.71587	0.59751	3.89971	0.62916	4.09329	0.66237	4.29711	0.69724	4.51167
0.95	0.28456	3.75059	0.29968	3.93615	0.31555	4.13154	0.33221	4.33726	0.34970	4.55382
1.0	**0.00**	3.76220	**0.00**	3.94832	**0.00**	4.14431	**0.00**	4.35067	**0.00**	4.56791
1.05	**0.28456**	3.75059	**0.29968**	3.93615	**0.31555**	4.13154	**0.33221**	4.33726	**0.34970**	4.55382
1.1	**0.56737**	3.71587	**0.59751**	3.89971	**0.62916**	4.09329	**0.66237**	4.29711	**0.69724**	4.51167
1.15	**0.84667**	3.65825	**0.89166**	3.83923	**0.93888**	4.02981	**0.98845**	4.23046	**1.04049**	4.44170
1.2	**1.12076**	3.57806	**1.18032**	3.75507	**1.24282**	3.94148	**1.30844**	4.13773	**1.37732**	4.34433
1.25	**1.38794**	3.47581	**1.46169**	3.64777	**1.53910**	3.82885	**1.62035**	4.01950	**1.70566**	4.22019
1.3	**1.64656**	3.35214	**1.73405**	3.51798	**1.82589**	3.69261	**1.92228**	3.87647	**2.02349**	4.07003
1.35	**1.89503**	3.20780	**1.99573**	3.36649	**2.10142**	3.53361	**2.21236**	3.70956	**2.32883**	3.89478
1.4	**2.13182**	3.04368	**2.24509**	3.19426	**2.36399**	3.35283	**2.48879**	3.51977	**2.61982**	3.69552
1.45	**2.35546**	2.86080	**2.48062**	3.00232	**2.61199**	3.15137	**2.74988**	3.30828	**2.89466**	3.47347
1.5	**2.56458**	2.66027	**2.70085**	2.79188	**2.84389**	2.93048	**2.99402**	3.07639	**3.15165**	3.23000
1.55	**2.75789**	2.44335	**2.90443**	2.56423	**3.05825**	2.69152	**3.21970**	2.82553	**3.38921**	2.96661
1.6	**2.93420**	2.21136	**3.09011**	2.32076	**3.25376**	2.43597	**3.42553**	2.55726	**3.60588**	2.68495
1.65	**3.09241**	1.96574	**3.23673**	2.06299	**3.42920**	2.16540	**3.61024**	2.27322	**3.80031**	2.38672
1.7	**3.23156**	1.70800	**3.40327**	1.79250	**3.58351**	1.88148	**3.77269**	1.97516	**3.97131**	2.07379
1.75	**3.35078**	1.43973	**3.52883**	1.51096	**3.71571**	1.58596	**3.91188**	1.66493	**4.11783**	1.74806
1.8	**3.44935**	1.16258	**3.63264**	1.22010	**3.82501**	1.28066	**4.02695**	1.34443	**4.23896**	1.41156
1.85	**3.52666**	0.87827	**3.71404**	0.92172	**3.91074**	0.96747	**4.11720**	1.01564	**4.33396**	1.06636
1.9	**3.58221**	0.58854	**3.77256**	0.61765	**3.97235**	0.64831	**4.18206**	0.68060	**4.40223**	0.71458
1.95	**3.61568**	0.29518	**3.80781**	0.30978	**4.00946**	0.32516	**4.22113**	0.34135	**4.44337**	0.35839
2.0	**3.62686**	0.00	**3.81958**	0.00	**4.02186**	0.00	**4.23419**	0.00	**4.45711**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(2.2 + i\,\underline{1.0}) = 0 + i\,4.56791$.
$\sinh(2.2 + i\,\underline{1.5}) = -3.15165 + i\,3.23000$.

q	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
0	4.69117	0.00	4.93696	0.00	5.19510	0.00	5.46623	0.00	5.75103	0.00
0.05	4.67671	0.37633	4.92174	0.39522	5.17909	0.41509	5.44938	0.43599	5.73330	0.45799
0.1	4.63341	0.75035	4.87618	0.78799	5.13114	0.82761	5.39893	0.86930	5.68022	0.91316
0.15	4.56155	1.11974	4.80056	1.17592	5.05156	1.23504	5.31521	1.29724	5.59213	1.36269
0.2	4.46157	1.48222	4.69533	1.55659	4.94083	1.63485	5.19869	1.71719	5.46955	1.80383
0.25	4.33407	1.83557	4.56116	1.92766	4.79965	2.02457	5.05014	2.12655	5.31325	2.23385
0.03	4.17986	2.17760	4.39887	2.28685	4.62887	2.40182	4.87045	2.52280	5.12420	2.65009
0.35	3.99987	2.50620	4.20946	2.63194	4.42955	2.76426	4.66073	2.90349	4.90356	3.04999
0.4	3.79523	2.81935	3.99409	2.96081	4.20292	3.10966	4.42228	3.26629	4.65268	3.43109
0.45	3.56719	3.11512	3.75410	3.27141	3.95038	3.43588	4.15656	3.60894	4.37311	3.79104
0.5	3.31716	3.39168	3.49096	3.56185	3.67351	3.74093	3.86521	3.92935	4.06659	4.12761
0.55	3.04677	3.64734	3.20630	3.83034	3.37395	4.02290	3.55003	4.22554	3.73499	4.43873
0.6	2.75740	3.88050	2.90188	4.07520	3.05360	4.28008	3.21297	4.49567	3.38036	4.72249
0.65	2.45113	4.08975	2.57956	4.29494	2.71443	4.51087	2.85610	4.73808	3.00490	4.97713
0.7	2.12975	4.27377	2.24134	4.48820	2.35853	4.71384	2.48162	4.95127	2.61091	5.20109
0.75	1.79523	4.43145	1.88930	4.65378	1.98808	4.88776	2.09184	5.13394	2.20082	5.39298
0.8	1.44965	4.56181	1.52560	4.79058	1.60537	5.03153	1.68916	5.28496	1.77716	5.55162
0.85	1.09513	4.66404	1.15251	4.89805	1.21277	5.14429	1.27607	5.40341	1.34255	5.67603
0.9	0.73386	4.73751	0.77231	4.97521	0.81269	5.22533	0.85511	5.48853	0.89966	5.76545
0.95	0.36807	4.78178	0.38735	5.02169	0.40760	5.27416	0.42888	5.53981	0.45122	5.81933
1.0	0.00	4.79657	0.00	5.03722	0.00	5.29047	0.00	5.55695	0.00	5.83732
1.05	**0.36807**	4.78178	**0.38735**	5.02169	**0.40760**	5.27416	**0.42888**	5.53981	**0.45122**	5.81933
1.1	**0.73386**	4.73751	**0.77231**	4.97521	**0.81269**	5.22533	**0.85511**	5.48853	**0.89966**	5.76545
1.15	**1.09513**	4.66404	**1.15251**	4.89805	**1.21277**	5.14429	**1.27607**	5.40341	**1.34255**	5.67603
1.2	**1.44965**	4.56181	**1.52560**	4.79058	**1.60537**	5.03153	**1.68916**	5.28496	**1.77716**	5.55162
1.25	**1.79523**	4.43145	**1.88930**	4.65378	**1.98808**	4.88776	**2.09184**	5.13394	**2.20082**	5.39298
1.3	**2.12975**	4.27377	**2.24134**	4.48820	**2.35853**	4.71384	**2.48162**	4.95127	**2.61091**	5.20109
1.35	**2.45113**	4.08975	**2.57956**	4.29494	**2.71443**	4.51087	**2.85610**	4.73808	**3.00490**	4.97713
1.4	**2.75740**	3.88050	**2.90188**	4.07520	**3.05360**	4.28008	**3.21297**	4.49567	**3.38036**	4.72249
1.45	**3.04677**	3.64734	**3.20630**	3.83034	**3.37395**	4.02290	**3.55003**	4.22554	**3.73499**	4.43873
1.5	**3.31716**	3.39168	**3.49096**	3.56185	**3.67351**	3.74093	**3.86521**	3.92935	**4.06659**	4.12761
1.55	**3.56719**	3.11512	**3.75410**	3.27141	**3.95038**	3.43588	**4.15656**	3.60894	**4.37311**	3.79104
1.6	**3.79523**	2.81935	**3.99409**	2.96081	**4.20292**	3.10966	**4.42228**	3.26629	**4.65268**	3.43109
1.65	**3.99987**	2.50620	**4.20946**	2.63194	**4.42955**	2.76426	**4.66073**	2.90349	**4.90356**	3.04999
1.7	**4.17986**	2.17760	**4.39887**	2.28685	**4.62887**	2.40182	**4.87045**	2.52280	**5.12420**	2.65009
1.75	**4.33407**	1.83557	**4.56116**	1.92766	**4.79965**	2.02457	**5.05014**	2.12655	**5.31325**	2.23385
1.8	**4.46157**	1.48222	**4.69533**	1.55659	**4.94083**	1.63485	**5.19869**	1.71719	**5.46955**	1.80383
1.85	**4.56155**	1.11974	**4.80056**	1.17592	**5.05156**	1.23504	**5.31521**	1.29724	**5.59213**	1.36269
1.9	**4.63341**	0.75035	**4.87618**	0.78799	**5.13114**	0.82761	**5.39893**	0.86930	**5.68022**	0.91316
1.95	**4.67671**	0.37633	**4.92174**	0.39522	**5.17909**	0.41509	**5.44938**	0.43599	**5.73330**	0.45799
2.0	**4.69117**	0.00	**4.93696**	0.00	**5.19510**	0.00	**5.46623**	0.00	**5.75103**	0.00

Note. Negative quantities are in heavy type.

Examples. sinh $(2.4 + i\,\underline{0.05}) = 5.44938 + i\,0.43599$.
sinh $(2.4 + i\,\underline{1.95}) = -5.44938 + i\,0.43599$.

q	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
0	6.05020	0.00	6.36451	0.00	6.69473	0.00	7.04169	0.00	7.40626	0.00
0.05	6.03155	0.48113	6.34489	0.50548	6.67409	0.53109	7.01998	0.55803	7.38343	0.58636
0.1	5.97572	0.95930	6.28615	1.00784	6.61231	1.05891	6.95500	1.11262	7.31508	1.16911
0.15	5.88304	1.43155	6.18866	1.50399	6.50976	1.58019	6.84713	1.66034	7.20163	1.74465
0.2	5.75408	1.89498	6.05301	1.99087	6.36706	2.09174	6.69705	2.19784	7.04377	2.30943
0.25	5.58966	2.34673	5.88004	2.46547	6.18512	2.59039	6.50567	2.72178	6.84249	2.85997
0.3	5.39077	2.78401	5.67082	2.92488	5.96505	3.07306	6.27419	3.22894	6.59903	3.39288
0.35	5.15865	3.20411	5.42664	3.36624	5.70819	3.53680	6.00403	3.71619	6.31488	3.90488
0.4	4.89472	3.60448	5.14900	3.78686	5.41615	3.97872	5.69685	4.18053	5.99179	4.39279
0.45	4.60062	3.98260	4.83961	4.18413	5.09071	4.39612	5.35454	4.61910	5.63177	4.85363
0.5	4.27814	4.33619	4.50039	4.55560	4.73389	4.78641	4.97923	5.02919	5.23702	5.28454
0.55	3.92929	4.66304	4.13342	4.89898	4.34788	5.14719	4.57321	5.40827	4.80998	5.68287
0.6	3.55622	4.96113	3.74097	5.21217	3.93506	5.47624	4.13900	5.75401	4.35329	6.04606
0.65	3.16122	5.22864	3.32545	5.49321	3.49799	5.77153	3.67927	6.06427	3.86976	6.37218
0.7	2.74674	5.46392	2.88943	5.74039	3.03934	6.03123	3.19686	6.33714	3.36237	6.65891
0.75	2.31531	5.66550	2.43559	5.95218	2.56196	6.25374	2.69474	6.57095	2.83425	6.90458
0.8	1.86961	5.83215	1.96674	6.12727	2.06878	6.43770	2.17600	6.76424	2.28866	7.10769
0.85	1.41239	5.96287	1.48577	6.26458	1.56285	6.58199	1.64385	6.91583	1.72896	7.26697
0.9	0.94646	6.05680	0.99563	6.36327	1.04729	6.68567	1.10156	7.02478	1.15859	7.38146
0.95	0.47469	6.11339	0.49935	6.42273	0.52526	6.74814	0.55249	7.09042	0.58109	7.45043
1.0	**0.00**	6.13229	**0.00**	6.44259	**0.00**	6.76901	**0.00**	7.11234	**0.00**	7.47347
1.05	**0.47469**	6.11339	**0.49935**	6.42273	**0.52526**	6.74814	**0.55249**	7.09042	**0.58109**	7.45043
1.1	**0.94646**	6.05680	**0.99563**	6.36327	**1.04729**	6.68567	**1.10156**	7.02478	**1.15859**	7.38146
1.15	**1.41239**	5.96287	**1.48577**	6.26458	**1.56285**	6.58199	**1.64385**	6.91583	**1.72896**	7.26697
1.2	**1.86961**	5.83215	**1.96674**	6.12727	**2.06878**	6.43770	**2.17600**	6.76424	**2.28866**	7.10769
1.25	**2.31531**	5.66550	**2.43559**	5.95218	**2.56196**	6.25374	**2.69474**	6.57095	**2.83425**	6.90458
1.3	**2.74674**	5.46392	**2.88943**	5.74039	**3.03934**	6.03123	**3.19686**	6.33714	**3.36237**	6.65891
1.35	**3.16122**	5.22864	**3.32545**	5.49321	**3.49799**	5.77153	**3.67927**	6.06427	**3.86976**	6.37218
1.4	**3.55622**	4.96113	**3.74097**	5.21217	**3.93506**	5.47624	**4.13900**	5.75401	**4.35329**	6.04606
1.45	**3.92929**	4.66304	**4.13342**	4.89898	**4.34788**	5.14719	**4.57321**	5.40827	**4.80998**	5.68287
1.5	**4.27814**	4.33619	**4.50039**	4.55560	**4.73389**	4.78641	**4.97923**	5.02919	**5.23702**	5.28454
1.55	**4.60062**	3.98260	**4.83961**	4.18413	**5.09071**	4.39612	**5.35454**	4.61910	**5.63177**	4.85363
1.6	**4.89472**	3.60448	**5.14900**	3.78686	**5.41615**	3.97872	**5.69685**	4.18053	**5.99179**	4.39279
1.65	**5.15865**	3.20411	**5.42664**	3.36624	**5.70819**	3.53680	**6.00403**	3.71619	**6.31488**	3.90488
1.7	**5.39077**	2.78401	**5.67082**	2.92488	**5.96505**	3.07306	**6.27419**	3.22894	**6.59903**	3.39288
1.75	**5.58966**	2.34673	**5.88004**	2.46547	**6.18512**	2.59039	**6.50567**	2.72178	**6.84249**	2.85997
1.8	**5.75408**	1.89498	**6.05301**	1.99087	**6.36706**	2.09174	**6.69705**	2.19784	**7.04377**	2.30943
1.85	**5.88304**	1.43155	**6.18866**	1.50399	**6.50976**	1.58019	**6.84713**	1.66034	**7.20163**	1.74465
1.9	**5.97572**	0.95930	**6.28615**	1.00784	**6.61231**	1.05891	**6.95500**	1.11262	**7.31508**	1.16911
1.95	**6.03155**	0.48113	**6.34489**	0.50548	**6.67409**	0.53109	**7.01998**	0.55803	**7.38343**	0.58636
2.0	**6.05020**	0.00	**6.36451**	0.00	**6.69473**	0.00	**7.04169**	0.00	**7.40626**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(2.7 + i\,\underline{0.7}) = 3.36237 + i\,6.65891$.

$\sinh(2.5 + i\,\underline{1.25}) = -2.31531 + i\,5.66550$.

q	$x = 2.75$		$x = 2.8$		$x = 2.85$		$x = 2.9$		$x = 2.95$	
0	7.78935	0.00	8.19192	0.00	8.61497	0.00	9.05956	0.00	9.52681	0.00
0.05	7.76534	0.61616	8.16666	0.64750	8.58841	0.68046	9.03163	0.71512	9.49744	0.75157
0.1	7.69345	1.22852	8.09106	1.29101	8.50891	1.35673	8.94802	1.42583	9.40952	1.49851
0.15	7.57413	1.83331	7.96557	1.92656	8.37694	2.02463	8.80924	2.12776	9.26358	2.23621
0.2	7.40811	2.42680	7.79098	2.55023	8.19332	2.68005	8.61616	2.81656	9.06053	2.96012
0.25	7.19642	3.00532	7.56834	3.15818	7.95919	3.31894	8.36994	3.48800	8.80162	3.66578
0.3	6.94036	3.56531	7.29905	3.74666	7.67599	3.93738	8.07213	4.13793	8.48845	4.34884
0.35	6.64151	4.10333	6.98476	4.31204	7.34547	4.53153	7.72455	4.76236	8.12294	5.00509
0.4	6.30172	4.61604	6.62740	4.85083	6.96966	5.09775	7.32934	5.35742	7.70735	5.63049
0.45	5.92307	5.10030	6.22918	5.35972	6.55088	5.63254	6.88894	6.91945	7.24424	6.22116
0.5	5.50790	5.55311	5.79256	5.83556	6.09170	6.13261	6.40608	6.44498	6.73647	6.77348
0.55	5.05878	5.97168	5.32022	6.27542	5.59498	6.59486	5.88371	6.93078	6.18717	7.28404
0.6	4.57847	6.35344	4.81509	6.67660	5.06375	7.01646	5.32508	7.37385	5.63048	7.74969
0.65	4.06993	6.69602	4.28026	7.03661	4.50131	7.39479	4.73361	7.77146	4.97774	8.16757
0.7	3.53629	6.99732	3.71905	7.35323	3.91112	7.72754	4.11295	8.12115	4.32508	8.53508
0.75	2.98086	7.25548	3.13491	7.62452	3.29681	8.01263	3.46694	8.42078	3.64575	8.84998
0.8	2.40704	7.46891	2.53144	7.84881	2.66217	8.24834	2.79956	8.66850	2.94395	9.11031
0.85	1.81839	7.63629	1.91237	8.02470	2.01112	8.43318	2.11491	8.86275	2.22399	9.31447
0.9	1.21852	7.75659	1.28150	8.15112	1.34768	8.56604	1.41723	9.00237	1.49032	9.46121
0.95	0.61115	7.82907	0.64273	8.22728	0.67592	8.64608	0.71081	9.08649	0.74747	9.54962
1.0	0.00	7.85328	0.00	8.25273	0.00	8.67281	0.00	9.11458	0.00	9.57915
1.05	**0.61115**	7.82907	**0.64273**	8.22728	**0.67592**	8.64608	**0.71081**	9.08649	**0.74747**	9.54962
1.1	**1.21852**	7.75659	**1.28150**	8.15112	**1.34768**	8.56604	**1.41723**	9.00237	**1.49032**	9.46121
1.15	**1.81839**	7.63629	**1.91237**	8.02470	**2.01112**	8.43318	**2.11491**	8.86275	**2.22399**	9.31447
1.2	**2.40704**	7.46891	**2.53144**	7.84881	**2.66217**	8.24834	**2.79956**	8.66850	**2.94395**	9.11031
1.25	**2.98086**	7.25548	**3.13491**	7.62452	**3.29681**	8.01263	**3.46694**	8.42078	**3.64575**	8.84998
1.3	**3.53629**	6.99732	**3.71905**	7.35323	**3.91112**	7.72754	**4.11295**	8.12115	**4.32508**	8.53508
1.35	**4.06993**	6.69602	**4.28026**	7.03661	**4.50131**	7.39479	**4.73361**	7.77146	**4.97774**	8.16757
1.4	**4.57847**	6.35344	**4.81509**	6.67660	**5.06375**	7.01646	**5.32508**	7.37385	**5.63048**	7.74969
1.45	**5.05878**	5.97168	**5.32022**	6.27542	**5.59498**	6.59486	**5.88371**	6.93078	**6.18717**	7.28404
1.5	**5.50790**	5.55311	**5.79256**	5.83556	**6.09170**	6.13261	**6.40608**	6.44498	**6.73647**	6.77348
1.55	**5.92307**	5.10030	**6.22918**	5.35972	**6.55088**	5.63254	**6.88894**	5.91945	**7.24424**	6.22116
1.6	**6.30172**	4.61604	**6.62740**	4.85083	**6.96966**	5.09775	**7.32934**	5.35742	**7.70735**	5.63049
1.65	**6.64151**	4.10333	**6.98476**	4.31204	**7.34547**	4.53153	**7.72455**	4.76236	**8.12294**	5.00509
1.7	**6.94036**	3.56531	**7.29905**	3.74666	**7.67599**	3.93738	**8.07213**	4.13793	**8.48845**	4.34884
1.75	**7.19642**	3.00532	**7.56834**	3.15818	**7.95919**	3.31894	**8.36994**	3.48800	**8.80162**	3.66578
1.8	**7.40811**	2.42680	**7.79098**	2.55023	**8.19332**	2.68005	**8.61616**	2.81656	**9.06053**	2.96012
1.85	**7.57413**	1.83331	**7.96557**	1.92656	**8.37694**	2.02463	**8.80924**	2.12776	**9.26358**	2.23621
1.9	**7.69345**	1.22852	**8.09106**	1.29101	**8.50891**	1.35673	**8.94802**	1.42583	**9.40952**	1.49851
1.95	**7.76534**	0.61616	**8.16666**	0.64750	**8.58841**	0.68046	**9.03163**	0.71512	**9.49744**	0.75157
2.0	**7.78935**	0.00	**8.19192**	0.00	**8.61497**	0.00	**9.05956**	0.00	**9.52681**	0.00

Note. Negative quantities are in heavy type.

Examples. sinh $(2.9 + i\,\underline{0.9}) = 1.41723 + i\,9.00237$.
sinh $(2.8 + i\,\underline{1.4}) = -4.81509 + i\,6.67660$.

q	$x = 3.0$		$x = 3.05$		$x = 3.10$		$x = 3.15$		$x = 3.20$	
0.0	10.01787	0.00	10.53399	0.00	11.07645	0.00	11.64661	0.00	12.24588	0.00
0.05	9.98699	0.78990	10.50150	0.83020	11.04230	0.87258	11.61070	0.91714	12.20810	0.96399
0.1	9.89454	1.57493	10.40430	1.65529	10.94010	1.73979	11.50320	1.82863	12.09510	1.92205
0.15	9.74108	2.35025	10.24290	2.47017	10.77040	2.59626	11.32480	2.72885	11.90750	2.86826
0.2	9.52757	3.11108	10.01840	3.26982	10.53430	3.43673	11.07660	3.61224	11.64650	3.79678
0.25	9.25531	3.85273	9.73216	4.04931	10.23330	4.25602	10.76010	4.47336	11.31370	4.70190
0.3	8.92599	4.57062	9.38586	4.80383	9.86919	5.04906	10.37720	5.30690	10.91120	5.57802
0.35	8.54164	5.26034	8.98171	5.52874	9.44423	5.81097	9.93036	6.10773	10.44130	6.41976
0.4	8.10463	5.91762	8.52218	6.21956	8.96104	6.53705	9.42230	6.87089	9.90712	7.22191
0.45	7.61765	6.53842	8.01011	6.87204	8.42260	7.22284	8.85615	7.59170	9.31184	7.97954
0.5	7.08371	7.11891	7.44866	7.48215	7.83223	7.86409	8.23539	8.26570	8.65915	8.68797
0.55	6.50609	7.65551	6.84128	8.04612	7.19358	8.45686	7.56387	8.88873	7.95306	9.34284
0.6	5.88836	8.14491	6.19173	8.56049	6.51058	8.99749	6.84570	9.45697	7.19795	9.94011
0.65	5.23433	8.58409	5.50400	9.02209	5.78743	9.48264	6.08533	9.96690	6.39846	10.47610
0.7	4.54806	8.97035	4.78233	9.42805	5.02860	9.90933	5.28745	10.41540	5.55952	10.94750
0.75	3.83368	9.30131	4.03119	9.77589	4.23878	10.27490	4.45696	10.79970	4.68630	11.35140
0.8	3.09569	9.57492	3.25518	10.06350	3.42281	10.57720	3.59900	11.11730	3.78419	11.68530
0.85	2.33863	9.78949	2.45911	10.28900	2.58575	10.81420	2.71885	11.36650	2.85874	11.94720
0.9	1.56714	9.94371	1.64788	10.45110	1.73274	10.98460	1.82193	11.54550	1.91568	12.13540
0.95	0.78599	10.03660	0.82649	10.54870	0.86905	11.08720	0.91378	11.65340	0.96080	12.24880
1.0	**0.00**	10.06766	**0.00**	10.58135	**0.00**	11.12150	**0.00**	11.68946	**0.00**	12.28665
1.05	**0.78599**	10.03660	**0.82649**	10.54870	**0.86905**	11.08720	**0.91378**	11.65340	**0.96080**	12.24880
1.1	**1.56714**	9.94371	**1.64788**	10.45110	**1.73274**	10.98460	**1.82193**	11.54550	**1.91568**	12.13540
1.15	**2.33863**	9.78949	**2.45911**	10.28900	**2.58575**	10.81420	**2.71885**	11.36650	**2.85874**	11.94720
1.2	**3.09569**	9.57492	**3.25518**	10.06350	**3.42281**	10.57720	**3.59900**	11.11730	**3.78419**	11.68530
1.25	**3.83368**	9.30131	**4.03119**	9.77589	**4.23878**	10.27490	**4.45696**	10.79970	**4.68630**	11.35140
1.3	**4.54806**	8.97035	**4.78233**	9.42805	**5.02860**	9.90933	**5.28745**	10.41540	**5.55952**	10.94750
1.35	**5.23433**	8.58409	**5.50400**	9.02209	**5.78743**	9.48264	**6.08533**	9.96690	**6.39846**	10.47610
1.4	**5.88836**	8.14491	**6.19173**	8.56049	**6.51058**	8.99749	**6.84570**	9.45697	**7.19795**	9.94011
1.45	**6.50609**	7.65551	**6.84128**	8.04612	**7.19358**	8.45686	**7.56387**	8.88873	**7.95306**	9.34284
1.5	**7.08371**	7.11891	**7.44866**	7.48215	**7.83223**	7.86409	**8.23539**	8.26570	**8.65915**	8.68797
1.55	**7.61765**	6.53842	**8.01011**	6.87204	**8.42260**	7.22284	**8.85615**	7.59170	**9.31184**	7.97954
1.6	**8.10463**	5.91762	**8.52218**	6.21956	**8.96104**	6.53705	**9.42230**	6.87089	**9.90712**	7.22191
1.65	**8.54164**	5.26034	**8.98171**	5.52874	**9.44423**	5.81097	**9.93036**	6.10773	**10.44130**	6.41976
1.7	**8.92599**	4.57062	**9.38586**	4.80383	**9.86919**	5.04906	**10.37720**	5.30690	**10.91120**	5.57802
1.75	**9.25531**	3.85273	**9.73216**	4.04931	**10.23330**	4.25602	**10.76010**	4.47336	**11.31370**	4.70190
1.8	**9.52757**	3.11108	**10.01840**	3.26982	**10.53430**	3.43673	**11.07660**	3.61224	**11.64650**	3.79678
1.85	**9.74108**	2.35025	**10.24290**	2.47017	**10.77040**	2.59626	**11.32480**	2.72885	**11.90750**	2.86826
1.9	**9.89454**	1.57493	**10.40430**	1.65529	**10.94010**	1.73979	**11.50320**	1.82863	**12.09510**	1.92205
1.95	**9.98699**	0.78990	**10.50150**	0.83020	**11.04230**	0.87258	**11.61070**	0.91714	**12.20810**	0.96399
2.0	**10.01787**	0.00	**10.53399**	0.00	**11.07645**	0.00	**11.64661**	0.00	**12.24588**	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\sinh(3.0 + i\,\underline{0.95}) = 0.78599 + i\,10.03660$.
$\sinh(3.0 + i\,\underline{1.05}) = -\,0.78599 + i\,10.03660$.

q	$x = 3.25$		$x = 3.30$		$x = 3.35$		$x = 3.40$		$x = 3.45$	
0.0	12.87578	0.00	13.53788	0.00	14.23382	0.00	14.96536	0.00	15.73432	0.00
0.05	12.83610	1.01326	13.49615	1.06507	14.18950	1.11953	14.91923	1.17679	15.68581	1.23699
0.1	12.71726	2.02028	13.37120	2.12356	14.05851	2.23215	14.78111	2.34632	15.54061	2.46636
0.15	12.52002	3.01484	13.16388	3.16897	13.84054	3.33101	14.55188	3.50139	15.29959	3.68053
0.2	12.24560	3.99082	12.87530	4.19483	13.53717	4.40933	14.23291	4.63487	14.96423	4.87198
0.25	11.89566	4.94218	12.50736	5.19485	13.15033	5.46075	13.82620	5.73977	14.53662	6.03341
0.3	11.47240	5.86309	12.06234	6.16381	12.68244	6.47795	13.33423	6.80928	14.01940	7.15765
0.35	10.97841	6.74784	11.54294	7.09279	12.13633	7.45549	12.76006	7.83682	13.41572	8.23775
0.4	10.41673	7.59099	10.95235	7.97905	11.51541	8.38705	12.10723	8.81604	12.72933	9.26706
0.45	9.79082	8.38733	10.29428	8.81610	10.82349	9.26691	11.37975	9.74090	11.96447	10.23924
0.5	9.10455	9.13197	9.57273	9.59881	10.06483	10.08964	10.58212	10.60570	11.12585	11.14830
0.55	8.36217	9.82031	8.79215	10.32233	9.24413	10.85016	9.71923	11.40512	10.21863	11.98861
0.6	7.56820	10.44810	7.95737	10.98222	8.36643	11.54379	8.79642	12.13423	9.24840	12.75501
0.65	6.72758	11.01147	7.07352	11.57440	7.43715	12.16623	7.81938	12.78852	8.22116	13.44278
0.7	5.84548	11.50695	6.14670	12.09520	6.46202	12.71369	6.79414	13.36397	7.14324	14.04764
0.75	4.92735	11.93150	5.18072	12.54145	5.44705	13.18275	5.72700	13.85702	6.02127	14.56595
0.8	3.97883	12.28247	4.18343	12.91035	4.39850	13.57054	4.62455	14.26465	4.86217	14.99442
0.85	3.00579	12.55773	3.16036	13.19970	3.32282	13.87465	3.49359	14.58432	3.67311	15.33045
0.9	2.01422	12.75556	2.11780	13.40764	2.22666	14.09323	2.34110	14.81410	2.46139	15.57196
0.95	1.01022	12.87474	1.06217	13.53290	1.11677	14.22498	1.17417	14.95250	1.23450	15.71746
1.0	**0.00**	12.91456	**0.00**	13.57476	**0.00**	14.26891	**0.00**	14.99874	**0.00**	15.76607
1.05	**1.01022**	12.87474	**1.06217**	13.53290	**1.11677**	14.22498	**1.17417**	14.95250	**1.23450**	15.71746
1.1	**2.01422**	12.75556	**2.11780**	13.40764	**2.22666**	14.09323	**2.34110**	14.81410	**2.46139**	15.57196
1.15	**3.00579**	12.55773	**3.16036**	13.19970	**3.32282**	13.87465	**3.49359**	14.58432	**3.67311**	15.33045
1.2	**3.97883**	12.28247	**4.18343**	12.91035	**4.39850**	13.57054	**4.62455**	14.26465	**4.86217**	14.99442
1.25	**4.92735**	11.93150	**5.18072**	12.54145	**5.44705**	13.18275	**5.72700**	13.85702	**6.02127**	14.56595
1.3	**5.84548**	11.50695	**6.14670**	12.09520	**6.46202**	12.71369	**6.79414**	13.36397	**7.14324**	14.04764
1.35	**6.72758**	11.01147	**7.07352**	11.57440	**7.43715**	12.16623	**7.81938**	12.78852	**8.22116**	13.44278
1.4	**7.56820**	10.44810	**7.95737**	10.98222	**8.36643**	11.54379	**8.79642**	12.13423	**9.24840**	12.75501
1.45	**8.36217**	9.82031	**8.79215**	10.32233	**9.24413**	10.85016	**9.71923**	11.40512	**10.21863**	11.98861
1.5	**9.10455**	9.13197	**9.57273**	9.59881	**10.06483**	10.08964	**10.58212**	10.60570	**11.12585**	11.14830
1.55	**9.79082**	8.38733	**10.29428**	8.81610	**10.82349**	9.26691	**11.37975**	9.74090	**11.96447**	10.23924
1.6	**10.41673**	7.59099	**10.95235**	7.97905	**11.51541**	8.38705	**12.10723**	8.81604	**12.72933**	9.26706
1.65	**10.97841**	6.74784	**11.54294**	7.09279	**12.13633**	7.45549	**12.76006**	7.83682	**13.41572**	8.23775
1.7	**11.47240**	5.86309	**12.06234**	6.16381	**12.68244**	6.47795	**13.33423**	6.80928	**14.01940**	7.15765
1.75	**11.89566**	4.94218	**12.50736**	5.19485	**13.15033**	5.46075	**13.82620**	5.73977	**14.53662**	6.03341
1.8	**12.24560**	3.99082	**12.87530**	4.19483	**13.53717**	4.40933	**14.23291**	4.63487	**14.96423**	4.87198
1.85	**12.52002**	3.01484	**13.16388**	3.16897	**13.84054**	3.33101	**14.55188**	3.50139	**15.29959**	3.68053
1.9	**12.71726**	2.02028	**13.37120**	2.12356	**14.05851**	2.23215	**14.78111**	2.34632	**15.54061**	2.46636
1.95	**12.83610**	1.01326	**13.49615**	1.06507	**14.18950**	1.11953	**14.91923**	1.17679	**15.68581**	1.23699
2.0	**12.87578**	0.00	**13.53788**	0.00	**14.23382**	0.00	**14.96536**	0.00	**15.73432**	0.00

Note. Negative questions are in heavy type.

Examples. sinh $(3.40 + i\,0) = 14.96536 + i\,0$.
sinh $(3.45 + i\,\underline{1.45}) = -10.21863 + i\,11.98861$.

$q = \frac{y}{\pi/2} - n4 - m2$

$m, n = 0, 1, 2 \ldots$

select n so that $0 \le \frac{y}{\pi/2} - n4 \le 4$

select m so that $\le \left(\frac{y}{\pi/2} - n4\right) - m2 \le 2$

If $2 \le \frac{y}{\pi/2} - n4 \le 4$ multiply (sinh$[x + iq]$) by -1 ie $(-1)(u + iv)$

Table VII. HYPERBOLIC SINES. sinh $(x + iq) = u + iv$. Continued

q	$x = 3.50$		$x = 3.55$		$x = 3.60$		$x = 3.65$		$x = 3.70$	
0.0	16.54263	0.00	17.39230	0.00	18.28546	0.00	19.22434	0.00	20.21129	0.00
0.05	16.49163	1.30029	17.33870	1.36684	18.22900	1.43680	19.16506	1.51036	20.14900	1.58770
0.1	16.33896	2.59256	17.17817	2.72525	18.06033	2.86475	18.98765	3.01142	19.96246	3.16561
0.15	16.08555	3.86885	16.91175	4.06686	17.78022	4.27503	18.69316	4.49390	19.65290	4.72401
0.2	15.73300	5.12129	16.54105	5.38339	17.39050	5.65896	18.28342	5.94868	19.22208	6.25327
0.25	15.28340	6.34215	16.06840	6.66674	16.89356	7.00800	17.76096	7.36678	18.67280	7.74399
0.3	14.73960	7.52391	15.49665	7.90898	16.29246	8.31383	17.12900	8.73946	18.00840	9.18696
0.35	14.10490	8.65928	14.82933	9.10246	15.59090	9.56840	16.39143	10.05827	17.23295	10.57330
0.4	13.38330	9.74126	14.07066	10.23982	14.79326	10.76400	15.55281	11.31505	16.35127	11.89444
0.45	12.57910	10.76320	13.22520	11.31405	13.90436	11.89320	14.61830	12.50208	15.36878	13.14223
0.5	11.69740	11.71820	12.29820	12.31852	12.92978	12.94910	13.59365	13.61203	14.29155	14.30902
0.55	10.74357	12.60210	11.29540	13.24705	11.87545	13.92515	12.48520	14.63806	13.12620	15.38760
0.6	9.72361	13.40770	10.22293	14.09390	10.74789	14.81535	11.29972	15.57383	11.87990	16.37127
0.65	8.64360	14.13065	9.08745	14.85386	9.55412	15.61421	10.04469	16.41360	10.56037	17.25404
0.7	7.51020	14.76650	7.89594	15.52225	8.30143	16.31680	8.72766	17.15216	9.17573	18.03040
0.75	6.33059	15.31130	6.65574	16.09492	6.99754	16.91880	7.35683	17.78497	7.73453	18.69565
0.8	5.11195	15.76170	5.37451	16.56840	5.65052	17.41650	5.94065	18.30814	6.24563	19.24560
0.85	3.86180	16.11491	4.06015	16.93970	4.26865	17.80680	4.48783	18.71843	4.71823	19.67690
0.9	2.58783	16.36878	2.72075	17.20653	2.86047	18.08732	3.00735	19.01331	3.16174	19.98688
0.95	1.29792	16.52173	1.36458	17.36731	1.43466	18.25632	1.50832	19.19100	1.58576	20.17362
1.0	**0.00**	16.57282	**0.00**	17.42102	**0.00**	18.31278	**0.00**	19.25033	**0.00**	20.23601
1.05	**1.29792**	16.52173	**1.36458**	17.36731	**1.43466**	18.25632	**1.50832**	19.19100	**1.58576**	20.17362
1.1	**2.58783**	16.36878	**2.72075**	17.20653	**2.86047**	18.08732	**3.00735**	19.01331	**3.16174**	19.98688
1.15	**3.86180**	16.11491	**4.06015**	16.93970	**4.26865**	17.80680	**4.48783**	18.71843	**4.71823**	19.67690
1.2	**5.11195**	15.76170	**5.37451**	16.56840	**5.65052**	17.41650	**5.94065**	18.30814	**6.24563**	19.24560
1.25	**6.33059**	15.31130	**6.65574**	16.09492	**6.99754**	16.91880	**7.35683**	17.78497	**7.73453**	18.69565
1.3	**7.51020**	14.76650	**7.89594**	15.52225	**8.30143**	16.31680	**8.72766**	17.15216	**9.17573**	18.03040
1.35	**8.64360**	14.13065	**9.08745**	14.85386	**9.55412**	15.61421	**10.04469**	16.41360	**10.56037**	17.25404
1.4	**9.72361**	13.40770	**10.22293**	14.09390	**10.74789**	14.81535	**11.29972**	15.57383	**11.87990**	16.37127
1.45	**10.74357**	12.60210	**11.29540**	13.24705	**11.87545**	13.92515	**12.48520**	14.63806	**13.12620**	15.38760
1.5	**11.69740**	11.71820	**12.29820**	12.31852	**12.92978**	12.94910	**13.59365**	13.61203	**14.29155**	14.30902
1.55	**12.57910**	10.76320	**13.22520**	11.31405	**13.90436**	11.89320	**14.61830**	12.50208	**15.36878**	13.14223
1.6	**13.38330**	9.74126	**14.07066**	10.23982	**14.79326**	10.76400	**15.55281**	11.31505	**16.35127**	11.89444
1.65	**14.10490**	8.65928	**14.82933**	9.10246	**15.59090**	9.56840	**16.39143**	10.05827	**17.23295**	10.57330
1.7	**14.73960**	7.52391	**15.49665**	7.90898	**16.29246**	8.31383	**17.12900**	8.73946	**18.00840**	9.18696
1.75	**15.28340**	6.34215	**16.06840**	6.66674	**16.89356**	7.00800	**17.76096**	7.36678	**18.67280**	7.74399
1.8	**15.73300**	5.12129	**16.54105**	5.38339	**17.39050**	5.65896	**18.28342**	5.94868	**19.22208**	6.25327
1.85	**16.08555**	3.86885	**16.91175**	4.06686	**17.78022**	4.27503	**18.69316**	4.49390	**19.65290**	4.72401
1.9	**16.33896**	2.59256	**17.17817**	2.72525	**18.06033**	2.86475	**18.98765**	3.01142	**19.96246**	3.16561
1.95	**16.49163**	1.30029	**17.33870**	1.36684	**18.22900**	1.43680	**19.16506**	1.51036	**20.14900**	1.58770
2.0	**16.54263**	0.00	**17.39230**	0.00	**18.28546**	0.00	**19.22434**	0.00	**20.21129**	0.00

Note. Negative quantities are in heavy type.

Examples. sinh $(3.70 + i\,\underline{0.5}) = 14.29155 + i\,14.30902$.
sinh $(3.70 + i\,\underline{1.5}) = -14.29155 + i\,14.30902$.

q	$x = 3.75$		$x = 3.80$		$x = 3.85$		$x = 3.90$		$x = 3.95$	
0.0	21.24878	0.00	22.33941	0.00	23.48589	0.00	24.69110	0.00	25.95806	0.00
0.05	21.18327	1.66900	22.27052	1.75448	23.41348	1.84435	24.61500	1.93883	25.87805	2.03816
0.1	20.98716	3.32772	22.06437	3.49815	23.19673	3.67733	24.38710	3.86571	25.63849	4.06375
0.15	20.66167	4.96592	21.72216	5.22025	22.83696	5.48764	24.00888	5.76875	25.24084	6.06429
0.2	20.20879	6.57350	21.24603	6.91017	22.33640	7.26411	23.48262	7.63623	24.68760	8.02744
0.25	19.63131	8.14055	20.63891	8.55748	21.69813	8.99580	22.81160	9.45662	23.98212	9.94109
0.3	18.93280	9.65741	19.90455	10.15203	20.92608	10.67203	21.99993	11.21871	23.12881	11.79366
0.35	18.11756	11.11473	19.04746	11.68400	20.02501	12.28246	21.05272	12.91164	22.13290	13.57315
0.4	17.19062	12.50353	18.07296	13.14392	19.00048	13.81716	19.97556	14.52497	21.00052	15.26910
0.45	16.15770	13.81524	16.98701	14.52281	17.85880	15.26668	18.77526	16.04874	19.73867	16.87098
0.5	15.02516	15.04177	15.79634	15.81216	16.60702	16.62208	17.45924	17.47355	18.35512	18.36873
0.55	13.79998	16.17556	14.50828	17.00402	15.25286	17.87500	16.03558	18.79065	16.85842	19.75331
0.6	12.48971	17.20963	13.13076	18.09105	13.80465	19.01770	14.51307	19.99190	15.25776	21.01610
0.65	11.10246	18.13760	11.67230	19.06655	12.27134	20.04315	12.90106	21.06988	13.56305	22.14931
0.7	9.64674	18.95373	10.14188	19.92448	10.66233	20.94503	11.20952	22.01797	11.78474	23.14597
0.75	8.13156	19.65301	8.54892	20.65958	8.98766	21.71778	9.44887	22.83030	9.93373	23.99991
0.8	6.56624	20.23113	6.90325	21.26731	7.25754	22.35664	7.62997	23.50188	8.02149	24.70590
0.85	4.96043	20.68452	5.21503	21.74391	5.48267	22.85766	5.76402	24.02856	6.05979	25.25957
0.9	3.32404	21.01038	3.49465	22.08646	3.67400	23.21775	3.86254	24.40710	4.06074	25.65749
0.95	1.66716	21.20670	1.75273	22.29283	1.84268	23.43470	1.93724	24.63516	2.03665	25.89724
1.0	**0.00**	21.27230	**0.00**	22.36178	**0.00**	23.50717	**0.00**	24.71135	**0.00**	25.97731
1.05	**1.66716**	21.20670	**1.75273**	22.29283	**1.84268**	23.43470	**1.93724**	24.63516	**2.03665**	25.89724
1.1	**3.32404**	21.01038	**3.49465**	22.08646	**3.67400**	23.21775	**3.86254**	24.40710	**4.06074**	25.65749
1.15	**4.96043**	20.68452	**5.21503**	21.74391	**5.48267**	22.85766	**5.76402**	24.02856	**6.05979**	25.25957
1.2	**6.56624**	20.23113	**6.90325**	21.26731	**7.25754**	22.35664	**7.62997**	23.50188	**8.02149**	24.70590
1.25	**8.13156**	19.65301	**8.54892**	20.65958	**8.98766**	21.71778	**9.44887**	22.83030	**9.93373**	23.99991
1.3	**9.64674**	18.95373	**10.14188**	19.92448	**10.66233**	20.94503	**11.20952**	22.01797	**11.78474**	23.14597
1.35	**11.10246**	18.13760	**11.67230**	19.06655	**12.27134**	20.04315	**12.90106**	21.06988	**13.56305**	22.14931
1.4	**12.48971**	17.20963	**13.13076**	18.09105	**13.80465**	19.01770	**14.51307**	19.99190	**15.25776**	21.01610
1.45	**13.79998**	16.17556	**14.50828**	17.00402	**15.25286**	17.87500	**16.03558**	18.79065	**16.85842**	19.75331
1.5	**15.02516**	15.04177	**15.79634**	15.81216	**16.60702**	16.62208	**17.45924**	17.47355	**18.35512**	18.36873
1.55	**16.15770**	13.81524	**16.98701**	14.52281	**17.85880**	15.26668	**18.77526**	16.04874	**19.73867**	16.87098
1.6	**17.19062**	12.50353	**18.07296**	13.14392	**19.00048**	13.81716	**19.97556**	14.52497	**21.00052**	15.26910
1.65	**18.11756**	11.11473	**19.04746**	11.68400	**20.02501**	12.28246	**21.05272**	12.91164	**22.13290**	13.57315
1.7	**18.93280**	9.65741	**19.90455**	10.15203	**20.92608**	10.67203	**21.99993**	11.21871	**23.12881**	11.79366
1.75	**19.63131**	8.14055	**20.63891**	8.55748	**21.69813**	8.99580	**22.81160**	9.45662	**23.98212**	9.94109
1.8	**20.20879**	6.57350	**21.24603**	6.91017	**22.33640**	7.26411	**23.48262**	7.63623	**24.68760**	8.02744
1.85	**20.66167**	4.96592	**21.72216**	5.22025	**22.83696**	5.48764	**24.00888**	5.76875	**25.24084**	6.06429
1.9	**20.98716**	3.32772	**22.06437**	3.49815	**23.19673**	3.67733	**24.38710**	3.86571	**25.63849**	4.06375
1.95	**21.18327**	1.66900	**22.27052**	1.75448	**23.41348**	1.84435	**24.61500**	1.93883	**25.87805**	2.03816
2.0	**21.24878**	0.00	**22.33941**	0.00	**23.48589**	0.00	**24.69110**	0.00	**25.95806**	0.00

Note. Negative quantities are in heavy type.

Examples. $\sinh(3.90 + i\,\underline{0.75}) = 9.44887 + i\,22.83030.$
$\sinh(3.95 + i\,\underline{1.95}) = -25.87805 + i\,2.03816.$

TABLE VIII. HYPERBOLIC COSINES. $\cosh(x + iq) = u + iv$

q	$x = 0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
0	1.0000	0.00	1.00125	0.00	1.00500	0.00	1.01127	0.00	1.02007	0.00
0.05	0.99692	0.00	0.99816	0.00392	1.00191	0.00786	1.00815	0.01181	1.01692	0.01580
0.1	0.98769	0.00	0.98892	0.00783	0.99263	0.01567	0.99882	0.02355	1.00751	0.03150
0.15	0.97237	0.00	0.97385	0.01168	0.97724	0.02338	0.98333	0.03515	0.99188	0.04700
0.2	0.95106	0.00	0.95225	0.01546	0.95582	0.03095	0.96178	0.04653	0.97014	0.06222
0.25	0.92388	0.00	0.92503	0.01914	0.92850	0.03833	0.93429	0.05762	0.94242	0.07705
0.3	0.89101	0.00	0.89208	0.02271	0.89547	0.04547	0.90105	0.06835	0.90889	0.09141
0.35	0.85264	0.00	0.85367	0.02614	0.85691	0.05234	0.86225	0.07867	0.86975	0.10520
0.4	0.80902	0.00	0.81000	0.02940	0.81307	0.05888	0.81814	0.08850	0.82525	0.11834
0.45	0.76041	0.00	0.76133	0.03249	0.76421	0.06505	0.76898	0.09778	0.77567	0.13076
0.5	0.70711	0.00	0.70796	0.03537	0.71065	0.07083	0.71508	0.10646	0.72130	0.14237
0.55	0.64945	0.00	0.65023	0.03804	0.65270	0.07617	0.65677	0.11449	0.66248	0.15310
0.6	0.58779	0.00	0.58850	0.04047	0.59027	0.08104	0.59441	0.12181	0.59958	0.16288
0.65	0.52250	0.00	0.52313	0.04265	0.52511	0.08541	0.52839	0.12838	0.53298	0.17167
0.7	0.45399	0.00	0.45439	0.04457	0.45626	0.08925	0.45911	0.13415	0.46310	0.17939
0.75	0.38268	0.00	0.38316	0.04621	0.38460	0.09254	0.38700	0.13910	0.39036	0.18601
0.8	0.30902	0.00	0.30940	0.04757	0.31056	0.09526	0.31250	0.14319	0.31522	0.19148
0.85	0.23345	0.00	0.23374	0.04864	0.23461	0.09740	0.23608	0.14640	0.23813	0.19577
0.9	0.15643	0.00	0.15663	0.04941	0.15722	0.09893	0.15820	0.14871	0.15957	0.19886
0.95	0.07846	0.00	0.07856	0.04987	0.07885	0.09986	0.07934	0.15010	0.08003	0.20072
1.0	0.00	0.00	0.00	0.05002	0.00	0.10017	0.00	0.15056	0.00	0.20134
1.05	**0.07846**	0.00	**0.07856**	0.04987	**0.07885**	0.09986	**0.07934**	0.15010	**0.08003**	0.20072
1.1	**0.15643**	0.00	**0.15663**	0.04941	**0.15722**	0.09893	**0.15820**	0.14871	**0.15957**	0.19886
1.15	**0.23345**	0.00	**0.23374**	0.04864	**0.23461**	0.09740	**0.23608**	0.14640	**0.23813**	0.19577
1.2	**0.30902**	0.00	**0.30940**	0.04757	**0.31056**	0.09526	**0.31250**	0.14319	**0.31522**	0.19148
1.25	**0.38268**	0.00	**0.38316**	0.04621	**0.38460**	0.09254	**0.38700**	0.13910	**0.39036**	0.18601
1.3	**0.45399**	0.00	**0.45439**	0.04457	**0.45626**	0.08925	**0.45911**	0.13415	**0.46310**	0.17939
1.35	**0.52250**	0.00	**0.52313**	0.04265	**0.52511**	0.08541	**0.52839**	0.12838	**0.53298**	0.17167
1.4	**0.58779**	0.00	**0.58850**	0.04047	**0.59027**	0.08104	**0.59441**	0.12181	**0.59958**	0.16288
1.45	**0.64945**	0.00	**0.65023**	0.03804	**0.65270**	0.07617	**0.65677**	0.11449	**0.66248**	0.15310
1.5	**0.70711**	0.00	**0.70796**	0.03537	**0.71065**	0.07083	**0.71508**	0.10646	**0.72130**	0.14237
1.55	**0.76041**	0.00	**0.76133**	0.03249	**0.76421**	0.06505	**0.76898**	0.09778	**0.77567**	0.13076
1.6	**0.80902**	0.00	**0.81000**	0.02940	**0.81307**	0.05888	**0.81814**	0.08850	**0.82525**	0.11834
1.65	**0.85264**	0.00	**0.85367**	0.02614	**0.85691**	0.05234	**0.86225**	0.07867	**0.86975**	0.10520
1.7	**0.89101**	0.00	**0.89208**	0.02271	**0.89547**	0.04547	**0.90105**	0.06835	**0.90889**	0.09141
1.75	**0.92388**	0.00	**0.92503**	0.01914	**0.92850**	0.03833	**0.93429**	0.05762	**0.94242**	0.07705
1.8	**0.95106**	0.00	**0.95225**	0.01546	**0.95582**	0.03095	**0.96178**	0.04653	**0.97014**	0.06222
1.85	**0.97237**	0.00	**0.97385**	0.01168	**0.97724**	0.02338	**0.98333**	0.03515	**0.99188**	0.04700
1.9	**0.98769**	0.00	**0.98892**	0.00783	**0.99263**	0.01567	**0.99882**	0.02355	**1.00751**	0.03150
1.95	**0.99692**	0.00	**0.99816**	0.00392	**1.00191**	0.00786	**1.00815**	0.01181	**1.01692**	0.01580
2.0	**1.0000**	0.00	**1.00125**	0.00	**1.00500**	0.00	**1.01127**	0.00	**1.02007**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(0 + i\,\underline{0.75}) = 0.38268 + i\,0.$
$\cosh(0.2 + i\,\underline{1.5}) = -0.72130 + i\,0.14237$

Table VIII. HYPERBOLIC COSINES. $\cosh(x + iq) = u + iv$. Continued

q	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
0	1.03141	0.00	1.04534	0.00	1.06188	0.00	1.08107	0.00	1.10297	0.00
0.05	1.02823	0.01982	1.04212	0.02389	1.05860	0.02803	1.07774	0.03223	1.09957	0.03651
0.1	1.01871	0.03952	1.03247	0.04764	1.04880	0.05588	1.06776	0.06426	1.08939	0.07280
0.15	1.00292	0.05897	1.01646	0.07109	1.03254	0.08338	1.05120	0.09589	1.07250	0.10863
0.2	0.98093	0.07806	0.99418	0.09410	1.00991	0.11038	1.02816	0.12693	1.04899	0.14380
0.25	0.95290	0.09667	0.96577	0.11654	0.98105	0.13669	0.99878	0.15719	1.01901	0.17808
0.3	0.91900	0.11468	0.93140	0.13825	0.94614	0.16216	0.96324	0.18648	0.98275	0.21126
0.35	0.87942	0.13199	0.89130	0.15911	0.90540	0.18663	0.92177	0.21462	0.94044	0.24314
0.4	0.83443	0.14848	0.84570	0.17899	0.85908	0.20995	0.87461	0.24143	0.89232	0.27352
0.45	0.78429	0.16406	0.79488	0.19777	0.80746	0.23198	0.82206	0.26676	0.83871	0.30222
0.5	0.72932	0.17862	0.73917	0.21533	0.75086	0.25257	0.76443	0.29045	0.77992	0.32905
0.55	0.66985	0.19208	0.67889	0.23156	0.68964	0.27161	0.70210	0.31234	0.71632	0.35385
0.6	0.60625	0.20437	0.61444	0.24636	0.62416	0.28897	0.63544	0.33231	0.64831	0.37647
0.65	0.53891	0.21539	0.54619	0.25965	0.55483	0.30455	0.56486	0.35022	0.57630	0.39677
0.7	0.46825	0.22508	0.47457	0.27133	0.48208	0.31826	0.49080	0.36598	0.50074	0.41462
0.75	0.39471	0.23338	0.40003	0.28134	0.40636	0.33000	0.41371	0.37949	0.42209	0.42992
0.8	0.31872	0.24025	0.32303	0.28962	0.32814	0.33971	0.33407	0.39065	0.34084	0.44257
0.85	0.24078	0.24563	0.24403	0.29611	0.24789	0.34732	0.25237	0.39940	0.25748	0.45249
0.9	0.16135	0.24950	0.16353	0.30077	0.16611	0.35279	0.16912	0.40570	0.17254	0.45961
0.95	0.08092	0.25183	0.08202	0.30358	0.08331	0.35609	0.08482	0.40949	0.08654	0.46391
1.0	**0.00**	0.25261	**0.00**	0.30452	**0.00**	0.35719	**0.00**	0.41075	**0.00**	0.46534
1.05	**0.08092**	0.25183	**0.08202**	0.30358	**0.08331**	0.35609	**0.08482**	0.40949	**0.08654**	0.46391
1.1	**0.16135**	0.24950	**0.16353**	0.30077	**0.16611**	0.35279	**0.16912**	0.40570	**0.17254**	0.45961
1.15	**0.24078**	0.24563	**0.24403**	0.29611	**0.24789**	0.34732	**0.25237**	0.39940	**0.25748**	0.45249
1.2	**0.31872**	0.24025	**0.32303**	0.28962	**0.32814**	0.33971	**0.33407**	0.39065	**0.34084**	0.44257
1.25	**0.39471**	0.23338	**0.40003**	0.28134	**0.40636**	0.33000	**0.41371**	0.37949	**0.42209**	0.42992
1.3	**0.46825**	0.22508	**0.47457**	0.27133	**0.48208**	0.31826	**0.49080**	0.36598	**0.50074**	0.41462
1.35	**0.53891**	0.21539	**0.54619**	0.25965	**0.55483**	0.30455	**0.56486**	0.35022	**0.57630**	0.39677
1.4	**0.60625**	0.20437	**0.61444**	0.24636	**0.62416**	0.28897	**0.63544**	0.33231	**0.64831**	0.37647
1.45	**0.66985**	0.19208	**0.67889**	0.23156	**0.68964**	0.27161	**0.70210**	0.31234	**0.71632**	0.35385
1.5	**0.72932**	0.17862	**0.73917**	0.21533	**0.75086**	0.25257	**0.76443**	0.20945	**0.77992**	0.32905
1.55	**0.78429**	0.16406	**0.79488**	0.19777	**0.80746**	0.23198	**0.82206**	0.26676	**0.83871**	0.30222
1.6	**0.83443**	0.14848	**0.84570**	0.17899	**0.85908**	0.20995	**0.87461**	0.24143	**0.89232**	0.27352
1.65	**0.87942**	0.13199	**0.89130**	0.15911	**0.90540**	0.18663	**0.92177**	0.21462	**0.94044**	0.24314
1.7	**0.91900**	0.11468	**0.93140**	0.13825	**0.94614**	0.16216	**0.96324**	0.18648	**0.98275**	0.21126
1.75	**0.95290**	0.09667	**0.96577**	0.11654	**0.98105**	0.13669	**0.99878**	0.15719	**1.01901**	0.17808
1.8	**0.98093**	0.07806	**0.99418**	0.09410	**1.00991**	0.11038	**1.02816**	0.12693	**1.04899**	0.14380
1.85	**1.00292**	0.05897	**1.01646**	0.07109	**1.03254**	0.08338	**1.05120**	0.09589	**1.07250**	0.10863
1.9	**1.01871**	0.03952	**1.03247**	0.04764	**1.04880**	0.05588	**1.06776**	0.06426	**1.08939**	0.07280
1.95	**1.02823**	0.01982	**1.04212**	0.02389	**1.05860**	0.02803	**1.07774**	0.03223	**1.09957**	0.03651
2.0	**1.03141**	0.00	**1.04534**	0.00	**1.06188**	0.00	**1.08107**	0.00	**1.10297**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(0.3 + i\,\underline{0.9}) = 0.16353 + i\,0.30077.$

$\cosh(0.45 + i\,\underline{1.7}) = -0.98275 + i\,0.21126.$

q	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
0	1.12763	0.00	1.15510	0.00	1.18547	0.00	1.21879	0.00	1.25517	0.00
0.05	1.12415	0.04088	1.15154	0.04536	1.18181	0.04995	1.21504	0.05467	1.25130	0.05952
0.1	1.11374	0.08152	1.14088	0.09044	1.17087	0.09959	1.20379	0.10900	1.23972	0.11867
0.15	1.09647	0.12165	1.12319	0.13497	1.15271	0.14862	1.18512	0.16265	1.22049	0.17709
0.2	1.07244	0.16103	1.09857	0.17866	1.12744	0.19674	1.15912	0.21531	1.19374	0.23442
0.25	1.04179	0.19942	1.06717	0.22125	1.09523	0.24364	1.12602	0.26663	1.15962	0.29030
0.3	1.00472	0.23657	1.02920	0.26248	1.05626	0.28904	1.08595	0.31632	1.11836	0.34439
0.35	0.96146	0.27227	0.98489	0.30208	1.01078	0.33265	1.03919	0.36405	1.07021	0.39636
0.4	0.91227	0.30629	0.93450	0.33983	0.95906	0.37422	0.98602	0.40954	1.01545	0.44589
0.45	0.85745	0.33842	0.87835	0.37548	0.90144	0.41347	0.92678	0.45250	0.95444	0.49266
0.5	0.79735	0.36847	0.81678	0.40882	0.83825	0.45018	0.86182	0.49268	0.88754	0.53640
0.55	0.73233	0.39624	0.75018	0.43963	0.76990	0.48412	0.79154	0.52981	0.81517	0.57683
0.6	0.66280	0.42158	0.67895	0.46773	0.69680	0.51506	0.71639	0.56368	0.73777	0.61371
0.65	0.58918	0.44431	0.60354	0.49296	0.61940	0.54284	0.63682	0.59408	0.65582	0.64680
0.7	0.51193	0.46430	0.52441	0.51514	0.53819	0.56726	0.55332	0.62081	0.56984	0.67590
0.75	0.43152	0.48143	0.44204	0.53414	0.45366	0.58819	0.46641	0.64371	0.48033	0.70084
0.8	0.34846	0.49559	0.35695	0.54986	0.36633	0.60549	0.37663	0.66265	0.38787	0.72146
0.85	0.26324	0.50670	0.26965	0.56218	0.27674	0.61906	0.28452	0.67750	0.29301	0.73763
0.9	0.17640	0.51468	0.18070	0.57103	0.18545	0.62882	0.19066	0.68817	0.19635	0.74925
0.95	0.08847	0.51949	0.09063	0.57637	0.09301	0.63469	0.09563	0.69460	0.09848	0.75625
1.0	**0.00**	0.52110	**0.00**	0.57815	**0.00**	0.63665	**0.00**	0.69675	**0.00**	0.75858
1.05	**0.08847**	0.51949	**0.09063**	0.57637	**0.09301**	0.63469	**0.09563**	0.69460	**0.09848**	0.75625
1.1	**0.17640**	0.51468	**0.18070**	0.57103	**0.18545**	0.62882	**0.19066**	0.68817	**0.19635**	0.74925
1.15	**0.26324**	0.50670	**0.26965**	0.56218	**0.27674**	0.61906	**0.28452**	0.67750	**0.29301**	0.73763
1.2	**0.34846**	0.49559	**0.35695**	0.54986	**0.36633**	0.60549	**0.37663**	0.66265	**0.38787**	0.72146
1.25	**0.43152**	0.48143	**0.44204**	0.53414	**0.45366**	0.58819	**0.46641**	0.64371	**0.48033**	0.70084
1.3	**0.51193**	0.46430	**0.52441**	0.51514	**0.53819**	0.56726	**0.55332**	0.62081	**0.56984**	0.67590
1.35	**0.58918**	0.44431	**0.60354**	0.49296	**0.61940**	0.54284	**0.63682**	0.59408	**0.65582**	0.64680
1.4	**0.66280**	0.42158	**0.67895**	0.46773	**0.69680**	0.51506	**0.71639**	0.56368	**0.73777**	0.61371
1.45	**0.73233**	0.39624	**0.75018**	0.43963	**0.76990**	0.48412	**0.79154**	0.52981	**0.81517**	0.57683
1.5	**0.79735**	0.36847	**0.81678**	0.40882	**0.83825**	0.45018	**0.86182**	0.49268	**0.88754**	0.53640
1.55	**0.85745**	0.33842	**0.87835**	0.37548	**0.90144**	0.41347	**0.92678**	0.45250	**0.95444**	0.49266
1.6	**0.91227**	0.30629	**0.93450**	0.33983	**0.95906**	0.37422	**0.98602**	0.40954	**1.01545**	0.44589
1.65	**0.96146**	0.27227	**0.98489**	0.30208	**1.01078**	0.33265	**1.03919**	0.36405	**1.07021**	0.39636
1.7	**1.00472**	0.23657	**1.02920**	0.26248	**1.05626**	0.28904	**1.08595**	0.31632	**1.11836**	0.34439
1.75	**1.04179**	0.19942	**1.06717**	0.22125	**1.09523**	0.24364	**1.12602**	0.26663	**1.15962**	0.29030
1.8	**1.07244**	0.16103	**1.09857**	0.17866	**1.12744**	0.19674	**1.15912**	0.21531	**1.19374**	0.23442
1.85	**1.09647**	0.12165	**1.12319**	0.13497	**1.15271**	0.14862	**1.18512**	0.16265	**1.22049**	0.17709
1.9	**1.11374**	0.08152	**1.14088**	0.09044	**1.17087**	0.09959	**1.20379**	0.10900	**1.23972**	0.11867
1.95	**1.12415**	0.04088	**1.15154**	0.04536	**1.18181**	0.04995	**1.21504**	0.05467	**1.25130**	0.05952
2.0	**1.12763**	0.00	**1.15510**	0.00	**1.18547**	0.00	**1.21879**	0.00	**1.25517**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(0.6 + i\,\underline{0.95}) = 0.09301 + i\,0.63469$.
cosh $(0.6 + i\,\underline{1.05}) = -0.09301 + i\,0.63469$.

Table VIII. HYPERBOLIC COSINES. cosh $(x + iq) = u + iv$. Continued

q	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
0	1.29468	0.00	1.33743	0.00	1.38353	0.00	1.43309	0.00	1.48623	0.00
0.05	1.29069	0.06452	1.33331	0.06968	1.37927	0.07502	1.42867	0.08054	1.48164	0.08627
0.1	1.27874	0.12864	1.32097	0.13893	1.36650	0.14957	1.41544	0.16058	1.46793	0.17200
0.15	1.25891	0.19197	1.30048	0.20732	1.34530	0.22320	1.39349	0.23964	1.44516	0.25667
0.2	1.23132	0.25411	1.27198	0.27444	1.31582	0.29546	1.36294	0.31721	1.41348	0.33976
0.25	1.19613	0.31469	1.23563	0.33986	1.27822	0.36589	1.32400	0.39283	1.37309	0.42076
0.3	1.15356	0.37332	1.19166	0.40319	1.23274	0.43407	1.27689	0.46603	1.32425	0.49916
0.35	1.10390	0.42966	1.14035	0.46403	1.17965	0.49957	1.22194	0.53635	1.26722	0.57448
0.4	1.04742	0.48335	1.08201	0.52202	1.11930	0.56199	1.15939	0.60337	1.20238	0.64626
0.45	0.98449	0.53405	1.01700	0.57678	1.05205	0.62095	1.08973	0.66667	1.13013	0.71406
0.5	0.91548	0.58147	0.94571	0.62799	0.97830	0.67608	1.01334	0.72586	1.05092	0.77745
0.55	0.84083	0.62529	0.86859	0.67532	0.89853	0.72704	0.93071	0.78057	0.96523	0.83605
0.6	0.76100	0.66527	0.78613	0.71849	0.81322	0.77351	0.84235	0.83047	0.87358	0.88950
0.65	0.67647	0.70114	0.69881	0.75724	0.72290	0.81522	0.74879	0.87525	0.77655	0.93747
0.7	0.58777	0.73269	0.60718	0.79131	0.62811	0.85191	0.65061	0.91463	0.67473	0.97965
0.75	0.49545	0.75972	0.51182	0.82050	0.52945	0.88334	0.54842	0.94838	0.56875	1.01579
0.8	0.40008	0.78207	0.41329	0.84464	0.42753	0.90932	0.44285	0.97628	0.45927	1.04567
0.85	0.30224	0.79960	0.31222	0.86357	0.32298	0.92970	0.33455	0.99816	0.34695	1.06911
0.9	0.20253	0.81219	0.20922	0.87717	0.21643	0.94435	0.22418	1.01388	0.23250	1.08595
0.95	0.10158	0.81978	0.10493	0.88537	0.10855	0.95317	0.11244	1.02335	0.11661	1.09610
1.0	0.00	0.82232	0.00	0.88811	0.00	0.95612	0.00	1.02652	0.00	1.09948
1.05	**0.10158**	0.81978	**0.10493**	0.88537	**0.10855**	0.95317	**0.11244**	1.02335	**0.11661**	1.09610
1.1	**0.20253**	0.81219	**0.20922**	0.87717	**0.21643**	0.94435	**0.22418**	1.01388	**0.23250**	1.08595
1.15	**0.30224**	0.79960	**0.31222**	0.86357	**0.32298**	0.92970	**0.33455**	0.99816	**0.34695**	1.06911
1.2	**0.40008**	0.78207	**0.41329**	0.84464	**0.42753**	0.90932	**0.44285**	0.97628	**0.45927**	1.04567
1.25	**0.49545**	0.75972	**0.51182**	0.82050	**0.52945**	0.88334	**0.54842**	0.94838	**0.56875**	1.01579
1.3	**0.58777**	0.73269	**0.60718**	0.79131	**0.62811**	0.85191	**0.65061**	0.91463	**0.67473**	0.97965
1.35	**0.67647**	0.70114	**0.69881**	0.75724	**0.72290**	0.81522	**0.74879**	0.87525	**0.77655**	0.93747
1.4	**0.76100**	0.66527	**0.78613**	0.71849	**0.81322**	0.77351	**0.84235**	0.83047	**0.87358**	0.88950
1.45	**0.84083**	0.62529	**0.86859**	0.67532	**0.89853**	0.72704	**0.93071**	0.78057	**0.96523**	0.83605
1.5	**0.91548**	0.58147	**0.94571**	0.62799	**0.97830**	0.67608	**1.01334**	0.72586	**1.05092**	0.77745
1.55	**0.98449**	0.53405	**1.01700**	0.57678	**1.05205**	0.62095	**1.08973**	0.66667	**1.13013**	0.71406
1.6	**1.04742**	0.48335	**1.08201**	0.52202	**1.11930**	0.56199	**1.15939**	0.60337	**1.20238**	0.64626
1.65	**1.10390**	0.42966	**1.14035**	0.46403	**1.17965**	0.49957	**1.22194**	0.53635	**1.26722**	0.57448
1.7	**1.15356**	0.37332	**1.19166**	0.40319	**1.23274**	0.43407	**1.27689**	0.46603	**1.32425**	0.49916
1.75	**1.19613**	0.31469	**1.23563**	0.33986	**1.27822**	0.36589	**1.32400**	0.39283	**1.37309**	0.42076
1.8	**1.23132**	0.25411	**1.27198**	0.27444	**1.31582**	0.29546	**1.36294**	0.31721	**1.41348**	0.33976
1.85	**1.25891**	0.19197	**1.30048**	0.20732	**1.34530**	0.22320	**1.39349**	0.23964	**1.44516**	0.25667
1.9	**1.27874**	0.12864	**1.32097**	0.13893	**1.36650**	0.14957	**1.41544**	0.16058	**1.46793**	0.17200
1.95	**1.29069**	0.06452	**1.33331**	0.06968	**1.37927**	0.07502	**1.42867**	0.08054	**1.48164**	0.08627
2.0	**1.29468**	0.00	**1.33743**	0.00	**1.38353**	0.00	**1.43309**	0.00	**1.48623**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(0.9 + i\,\underline{1.0}) = 0 + i\,1.02652$.
cosh $(0.9 + i\,\underline{1.10}) = -0.22418 + i\,1.01388$.

TABLE VIII. HYPERBOLIC COSINES. cosh $(x + iq) = u + iv$. CONTINUED

q	$x = 1.0$		$x = 1.05$		$x = 1.1$		$x = 1.15$		$x = 1.2$	
0	1.54308	0.00	1.60379	0.00	1.66852	0.00	1.73741	0.00	1.81066	0.00
0.05	1.53832	0.09221	1.59885	0.09838	1.66337	0.10479	1.73206	0.11147	1.80507	0.11843
0.1	1.52408	0.18384	1.58405	0.19615	1.64798	0.20894	1.71602	0.22226	1.78836	0.23613
0.15	1.50045	0.27435	1.55948	0.29271	1.62242	0.31180	1.68941	0.33167	1.76063	0.35238
0.2	1.46756	0.36316	1.52530	0.38746	1.58685	0.41274	1.65238	0.43904	1.72204	0.46645
0.25	1.42562	0.44973	1.48171	0.47983	1.54151	0.51113	1.60517	0.54371	1.67283	0.57765
0.3	1.37490	0.53353	1.42899	0.56924	1.48666	0.60637	1.54805	0.64502	1.61331	0.68528
0.35	1.31569	0.61404	1.36746	0.65514	1.42265	0.69787	1.48139	0.74235	1.54384	0.78869
0.4	1.24838	0.69077	1.29750	0.73700	1.34986	0.78508	1.40560	0.83511	1.46485	0.88724
0.45	1.17337	0.76323	1.21953	0.81432	1.26875	0.86743	1.32114	0.92272	1.37684	0.98032
0.5	1.09112	0.83099	1.13405	0.88661	1.17982	0.94445	1.22854	1.00464	1.28033	1.06735
0.55	1.00215	0.89363	1.04158	0.95344	1.08362	1.01564	1.12836	1.08037	1.17593	1.14781
0.6	0.90700	0.95076	0.94269	1.01439	0.98073	1.08056	1.02123	1.14943	1.06428	1.22118
0.65	0.80626	1.00202	0.83798	1.06909	0.87180	1.13883	0.90780	1.21141	0.94607	1.28703
0.7	0.70055	1.04711	0.72811	1.11719	0.75749	1.19007	0.78877	1.26592	0.82202	1.34494
0.75	0.59051	1.08574	0.61375	1.15841	0.63852	1.23398	0.66488	1.31263	0.69291	1.39456
0.8	0.47684	1.11768	0.49560	1.19249	0.51560	1.27028	0.53689	1.35124	0.55952	1.43558
0.85	0.36023	1.14273	0.37440	1.21921	0.38951	1.29875	0.40559	1.38152	0.42269	1.46776
0.9	0.24139	1.16073	0.25089	1.23842	0.26101	1.31920	0.27179	1.40329	0.28325	1.49088
0.95	0.12107	1.17158	0.12583	1.24999	0.13091	1.33153	0.13632	1.41640	0.14206	1.50481
1.0	0.00	1.17520	0.00	1.25386	0.00	1.33565	0.00	1.42078	0.00	1.50946
1.05	**0.12107**	1.17158	**0.12583**	1.24999	**0.13091**	1.33153	**0.13632**	1.41640	**0.14206**	1.50481
1.1	**0.24139**	1.16073	**0.25089**	1.23842	**0.26101**	1.31920	**0.27179**	1.40329	**0.28325**	1.49088
1.15	**0.36023**	1.14273	**0.37440**	1.21921	**0.38951**	1.29875	**0.40559**	1.38152	**0.42269**	1.46776
1.2	**0.47684**	1.11768	**0.49560**	1.19249	**0.51560**	1.27028	**0.53689**	1.35124	**0.55952**	1.43558
1.25	**0.59051**	1.08574	**0.61375**	1.15841	**0.63852**	1.23398	**0.66488**	1.31263	**0.69291**	1.39456
1.3	**0.70055**	1.04711	**0.72811**	1.11719	**0.75749**	1.19007	**0.78877**	1.26592	**0.82202**	1.34494
1.35	**0.80626**	1.00202	**0.83798**	1.06909	**0.87180**	1.13883	**0.90780**	1.21141	**0.94607**	1.28703
1.4	**0.90700**	0.95076	**0.94269**	1.01439	**0.98073**	1.08056	**1.02123**	1.14943	**1.06428**	1.22118
1.45	**1.00215**	0.89363	**1.04158**	0.95344	**1.08362**	1.01564	**1.12836**	1.08037	**1.17593**	1.14781
1.5	**1.09112**	0.83099	**1.13405**	0.88661	**1.17982**	0.94445	**1.22854**	1.00464	**1.28033**	1.06735
1.55	**1.17337**	0.76323	**1.21953**	0.81432	**1.26875**	0.86743	**1.32114**	0.92272	**1.37684**	0.98032
1.6	**1.24838**	0.69077	**1.29750**	0.73700	**1.34986**	0.78508	**1.40560**	0.83511	**1.46485**	0.88724
1.65	**1.31569**	0.61404	**1.36746**	0.65514	**1.42265**	0.69787	**1.48139**	0.74235	**1.54384**	0.78869
1.7	**1.37490**	0.53353	**1.42899**	0.56924	**1.48666**	0.60637	**1.54805**	0.64502	**1.61331**	0.68528
1.75	**1.42562**	0.44973	**1.48171**	0.47983	**1.54151**	0.51113	**1.60517**	0.54371	**1.67283**	0.57765
1.8	**1.46756**	0.36316	**1.52530**	0.38746	**1.58685**	0.41274	**1.65238**	0.43904	**1.72204**	0.46645
1.85	**1.50045**	0.27435	**1.55948**	0.29271	**1.62242**	0.31180	**1.68941**	0.33167	**1.76063**	0.35238
1.9	**1.52408**	0.18384	**1.58405**	0.19615	**1.64798**	0.20894	**1.71602**	0.22226	**1.78836**	0.23613
1.95	**1.53832**	0.09221	**1.59885**	0.09838	**1.66337**	0.10479	**1.73206**	0.11147	**1.80507**	0.11843
2.0	**1.54308**	0.00	**1.60379**	0.00	**1.66852**	0.00	**1.73741**	0.00	**1.81066**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(1.2 + i\,0) = 1.81066 + i\,0.$

$\cosh(1.1 + i\,\underline{1.1}) = -0.26101 + i\,1.31920.$

q	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
0	1.88842	0.00	1.97091	0.00	2.05833	0.00	2.15090	0.00	2.24884	0.00
0.05	1.88260	0.12569	1.96484	1.13325	2.05200	0.14116	2.14427	0.14941	2.24191	0.15804
0.1	1.86517	0.25060	1.94665	0.26569	2.03299	0.28144	2.12442	0.29790	2.22115	0.31510
0.15	1.83624	0.37396	1.91646	0.39648	2.00146	0.41999	2.09147	0.44455	2.18671	0.47022
0.2	1.79600	0.49502	1.87445	0.52483	1.95759	0.55595	2.04562	0.58846	2.13878	0.62244
0.25	1.74467	0.61303	1.82089	0.64994	1.90165	0.68848	1.98717	0.72875	2.07766	0.77083
0.3	1.68260	0.72726	1.75610	0.77105	1.83399	0.81677	1.91646	0.86454	2.00373	0.91446
0.35	1.61014	0.83700	1.68048	0.88740	1.75502	0.94002	1.83394	0.99500	1.91745	1.05245
0.4	1.52777	0.94158	1.59451	0.99829	1.66523	1.05748	1.74012	1.11932	1.81935	1.18396
0.45	1.43597	1.04036	1.49870	1.10301	1.56517	1.16842	1.63556	1.23674	1.71007	1.30817
0.5	1.33532	1.13273	1.39365	1.20094	1.45546	1.27215	1.52092	1.34655	1.59017	1.42431
0.55	1.22643	1.21811	1.28001	1.29146	1.33678	1.36804	1.39690	1.44804	1.46051	1.53166
0.6	1.10999	1.29598	1.15848	1.37402	1.20986	1.45550	1.26427	1.54061	1.32184	1.62958
0.65	0.98670	1.36586	1.02980	1.44811	1.07548	1.53398	1.12384	1.62369	1.17502	1.71745
0.7	0.85733	1.42732	0.89478	1.51327	0.93446	1.60300	0.97649	1.69675	1.02095	1.79473
0.75	0.72267	1.47998	0.75424	1.56910	0.78769	1.66215	0.82311	1.75934	0.86060	1.86094
0.8	0.58355	1.52352	0.60905	1.61526	0.63606	1.71104	0.66466	1.81110	0.69493	1.91569
0.85	0.44084	1.55766	0.46010	1.65146	0.48051	1.74938	0.50212	1.85169	0.52498	1.95862
0.9	0.29541	1.58220	0.30832	1.67747	0.32199	1.77694	0.33647	1.88086	0.35180	1.98947
0.95	0.14816	1.59698	0.15464	1.69315	0.16150	1.79354	0.16876	1.89843	0.17644	2.00806
1.0	**0.00**	1.60192	**0.00**	1.69838	**0.00**	1.79909	**0.00**	1.90430	**0.00**	2.01427
1.05	**0.14816**	1.59698	**0.15464**	1.69315	**0.16150**	1.79354	**0.16876**	1.89843	**0.17644**	2.00806
1.1	**0.29541**	1.58220	**0.30832**	1.67747	**0.32199**	1.77694	**0.33647**	1.88086	**0.35180**	1.98947
1.15	**0.44084**	1.55766	**0.46010**	1.65146	**0.48051**	1.74938	**0.50212**	1.85169	**0.52498**	1.95862
1.2	**0.58355**	1.52352	**0.60905**	1.61526	**0.63606**	1.71104	**0.66466**	1.81110	**0.69493**	1.91569
1.25	**0.72267**	1.47998	**0.75424**	1.56910	**0.78769**	1.66215	**0.82311**	1.75934	**0.86060**	1.86094
1.3	**0.85733**	1.42732	**0.89478**	1.51327	**0.93446**	1.60300	**0.97649**	1.69675	**1.02095**	1.79473
1.35	**0.98670**	1.36586	**1.02980**	1.44811	**1.07548**	1.53398	**1.12384**	1.62369	**1.17502**	1.71745
1.4	**1.10999**	1.29598	**1.15848**	1.37402	**1.20986**	1.45550	**1.26427**	1.54061	**1.32184**	1.62958
1.45	**1.22643**	1.21811	**1.28001**	1.29146	**1.33678**	1.36804	**1.39690**	1.44804	**1.46051**	1.53166
1.5	**1.33532**	1.13273	**1.39365**	1.20094	**1.45546**	1.27215	**1.52092**	1.34655	**1.59017**	1.42431
1.55	**1.43597**	1.04036	**1.49870**	1.10301	**1.56517**	1.16842	**1.63556**	1.23674	**1.71007**	1.30817
1.6	**1.52777**	0.94158	**1.59451**	0.99829	**1.66523**	1.05748	**1.74012**	1.11932	**1.81935**	1.18396
1.65	**1.61014**	0.83700	**1.68048**	0.88740	**1.75502**	0.94002	**1.83394**	0.99500	**1.91745**	1.05245
1.7	**1.68260**	0.72726	**1.75610**	0.77105	**1.83399**	0.81677	**1.91646**	0.86454	**2.00373**	0.91446
1.75	**1.74467**	0.61303	**1.82089**	0.64994	**1.90165**	0.68848	**1.98717**	0.72875	**2.07766**	0.77083
1.8	**1.79600**	0.49502	**1.87445**	0.52483	**1.95759**	0.55595	**2.04562**	0.58846	**2.13878**	0.62244
1.85	**1.83624**	0.37396	**1.91646**	0.39648	**2.00146**	0.41999	**2.09147**	0.44455	**2.18671**	0.47022
1.9	**1.86517**	0.25060	**1.94665**	0.26569	**2.03299**	0.28144	**2.12442**	0.29790	**2.22115**	0.31510
1.95	**1.88260**	0.12569	**1.96484**	0.13325	**2.05200**	0.14116	**2.14427**	0.14941	**2.24191**	0.15804
2.0	**1.88842**	0.00	**1.97091**	0.00	**2.05833**	0.00	**2.15090**	0.00	**2.24884**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(1.4 + i\,\underline{1.9}) = -2.12442 + i\,0.29790$,
cosh $(1.4 + i\,\underline{1.4}) = -1.26427 + i\,1.54061$.

q	$x = 1.5$		$x = 1.55$		$x = 1.6$		$x = 1.65$		$x = 1.7$	
0	2.35241	0.00	2.46186	0.00	2.57746	0.00	2.69952	0.00	2.82832	0.00
0.05	2.34516	0.16706	2.45427	0.17650	2.56952	0.18639	2.69121	0.19673	2.81960	0.20757
0.1	2.32345	0.33309	2.43155	0.35192	2.54573	0.37162	2.66629	0.39225	2.79350	0.41387
0.15	2.28742	0.49707	2.39384	0.52516	2.50625	0.55456	2.62494	0.58536	2.75017	0.61761
0.2	2.23727	0.65798	2.34137	0.69517	2.45131	0.73409	2.56740	0.77485	2.68989	0.81754
0.25	2.17334	0.81484	2.27446	0.86089	2.38127	0.90909	2.49404	0.95957	2.61302	1.01244
0.3	2.09601	0.96667	2.19353	1.02130	2.29654	1.07848	2.40529	1.13837	2.52005	1.20109
0.35	2.00576	1.11255	2.09908	1.17542	2.19765	1.24123	2.30173	1.31015	2.41154	1.38234
0.4	1.90314	1.25156	1.99169	1.32229	2.08522	1.39632	2.18396	1.47385	2.28816	1.55506
0.45	1.78879	1.38286	1.87201	1.46101	1.95992	1.54281	2.05274	1.62847	2.15067	1.71820
0.5	1.66341	1.50563	1.74080	1.59071	1.82254	1.67978	1.90885	1.77305	1.99992	1.87074
0.55	1.52777	1.61912	1.59885	1.71062	1.67393	1.80640	1.75320	1.90669	1.83684	2.01175
0.6	1.38271	1.72263	1.44704	1.81997	1.51500	1.92187	1.58674	2.02858	1.66244	2.14036
0.65	1.22913	1.81551	1.28632	1.91811	1.34672	2.02550	1.41050	2.13797	1.47779	2.25577
0.7	1.06797	1.89720	1.11766	2.00442	1.17015	2.11664	1.22556	2.23417	1.28403	2.35727
0.75	0.90023	1.96720	0.94211	2.07837	0.98636	2.19473	1.03306	2.31660	1.08235	2.44424
0.8	0.72693	2.02507	0.76076	2.13951	0.79648	2.25930	0.83420	2.38474	0.87400	2.51614
0.85	0.54916	2.07045	0.57471	2.18745	0.60170	2.30993	0.63019	2.43818	0.66026	2.57253
0.9	0.36800	2.10307	0.38512	2.22191	0.40320	2.34632	0.42230	2.47659	0.44245	2.61306
0.95	0.18457	2.12272	0.19316	2.24268	0.20223	2.36824	0.21180	2.49973	0.22191	2.63747
1.0	**0.00**	2.12928	**0.00**	2.24961	**0.00**	2.37557	**0.00**	2.50747	**0.00**	2.64563
1.05	**0.18457**	2.12272	**0.19316**	2.24268	**0.20223**	2.36824	**0.21180**	2.49973	**0.22191**	2.63747
1.1	**0.36800**	2.10307	**0.38512**	2.22191	**0.40320**	2.34632	**0.42230**	2.47659	**0.44245**	2.61306
1.15	**0.54916**	2.07045	**0.57471**	2.18745	**0.60170**	2.30993	**0.63019**	2.43818	**0.66026**	2.57253
1.2	**0.72693**	2.02507	**0.76076**	2.13951	**0.79648**	2.25930	**0.83420**	2.38474	**0.87400**	2.51614
1.25	**0.90023**	1.96720	**0.94211**	2.07837	**0.98636**	2.19473	**1.03306**	2.31660	**1.08235**	2.44424
1.3	**1.06797**	1.89720	**1.11766**	2.00442	**1.17015**	2.11664	**1.22556**	2.23417	**1.28403**	2.35727
1.35	**1.22913**	1.81551	**1.28632**	1.91811	**1.34672**	2.02550	**1.41050**	2.13797	**1.47779**	2.25577
1.4	**1.38271**	1.72263	**1.44704**	1.81997	**1.51500**	1.92187	**1.58674**	2.02858	**1.66244**	2.14036
1.45	**1.52777**	1.61912	**1.59885**	1.71062	**1.67393**	1.80640	**1.75320**	1.90669	**1.83684**	2.01175
1.5	**1.66341**	1.50563	**1.74080**	1.59071	**1.82254**	1.67978	**1.90885**	1.77305	**1.99992**	1.87074
1.55	**1.78879**	1.38286	**1.87201**	1.46101	**1.95992**	1.54281	**2.05274**	1.62847	**2.15067**	1.71820
1.6	**1.90314**	1.25156	**1.99169**	1.32229	**2.08522**	1.39632	**2.18396**	1.47385	**2.28816**	1.55506
1.65	**2.00576**	1.11255	**2.09908**	1.17542	**2.19765**	1.24123	**2.30173**	1.31015	**2.41154**	1.38234
1.7	**2.09601**	0.96667	**2.19353**	1.02130	**2.29654**	1.07848	**2.40529**	1.13837	**2.52005**	1.20109
1.75	**2.17334**	0.81484	**2.27446**	0.86089	**2.38127**	0.90909	**2.49404**	0.95957	**2.61302**	1.01244
1.8	**2.23727**	0.65798	**2.34137**	0.69517	**2.45131**	0.73409	**2.56740**	0.77485	**2.68989**	0.81754
1.85	**2.28742**	0.49707	**2.39384**	0.52516	**2.50625**	0.55456	**2.62494**	0.58536	**2.75017**	0.61761
1.9	**2.32345**	0.33309	**2.43155**	0.35192	**2.54573**	0.37162	**2.66629**	0.39225	**2.79350**	0.41387
1.95	**2.34516**	0.16706	**2.45427**	0.17650	**2.56952**	0.18639	**2.69121**	0.19673	**2.81960**	0.20757
2.0	**2.35241**	0.00	**2.46186**	0.00	**2.57746**	0.00	**2.69952**	0.00	**2.82832**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(1.6 + i\,\underline{0.4}) = 2.08522 + i\,1.39632.$
$\cosh(1.7 + i\,\underline{1.2}) = -0.87400 + i\,2.51614.$

q	x = 1.75		x = 1.8		x = 1.85		x = 1.9		x = 1.95	
0	2.96419	0.00	3.10747	0.00	3.25853	0.00	3.41773	0.00	3.58548	0.00
0.05	2.95505	0.21893	3.09789	0.23084	3.24848	0.24332	3.40719	0.25642	3.57443	0.27015
0.1	2.92769	0.43652	3.06921	0.46026	3.21841	0.48627	3.37565	0.51125	3.54134	0.53864
0.15	2.88229	0.65141	3.02161	0.68684	3.16850	0.72398	3.32330	0.76294	3.48641	0.80380
0.2	2.81911	0.86229	2.95538	0.90918	3.09904	0.95835	3.25045	1.00992	3.41000	1.06401
0.25	2.73855	1.06784	2.87093	1.12592	3.01049	1.18681	3.15757	1.25067	3.31255	1.31766
0.3	2.64111	1.26682	2.76878	1.33572	2.90337	1.40796	3.04522	1.48372	3.19469	1.56318
0.35	2.52739	1.45799	2.64956	1.53728	2.77835	1.62042	2.91409	1.90761	3.05713	1.79907
0.4	2.39808	1.64016	2.51400	1.72937	2.63620	1.82289	2.76501	1.92098	2.90071	2.02387
0.45	2.25399	1.81223	2.36294	1.91079	2.47780	2.01413	2.59887	2.12250	2.72642	2.23618
0.5	2.09600	1.97312	2.19731	2.08043	2.30413	2.19294	2.41670	2.31094	2.53532	2.43471
0.55	1.92509	2.12185	2.01814	2.23725	2.11624	2.35824	2.21964	2.48513	2.32858	2.61823
0.6	1.74231	2.25749	1.82653	2.38027	1.91531	2.50900	2.00889	2.64400	2.10749	2.78561
0.65	1.54878	2.37922	1.62365	2.50862	1.70258	2.64429	1.78576	2.78657	1.87341	2.93582
0.7	1.34571	2.48627	1.41076	2.62149	1.47934	2.76327	1.55162	2.91196	1.62777	3.06792
0.75	1.13435	2.57800	1.18918	2.71821	1.24698	2.86522	1.30791	3.01939	1.37210	3.18111
0.8	0.91599	2.65384	0.96026	2.79817	1.00694	2.94950	1.05614	3.10821	1.10797	3.27468
0.85	0.69198	2.71331	0.72542	2.86088	0.76069	3.01560	0.79785	3.17787	0.83701	3.34807
0.9	0.46370	2.75606	0.48612	2.90595	0.50975	3.06311	0.53465	3.22793	0.56089	3.40081
0.95	0.23257	2.78181	0.24381	2.93310	0.25566	3.09173	0.26815	3.25809	0.28131	3.43259
1.0	0.00	2.79041	0.00	2.94217	0.00	3.10129	0.00	3.26816	0.00	3.44321
1.05	**0.23257**	2.78181	**0.24381**	2.93310	**0.25566**	2.09173	**0.26815**	3.25809	**0.28131**	3.43259
1.1	**0.46370**	2.75606	**0.48612**	2.90595	**0.50975**	3.06311	**0.53465**	3.22793	**0.56089**	3.40081
1.15	**0.69198**	2.71331	**0.72542**	2.86088	**0.76069**	3.01560	**0.79785**	3.17787	**0.83701**	3.34807
1.2	**0.91599**	2.65384	**0.96026**	2.79817	**1.00694**	2.94950	**1.05614**	3.10821	**1.10797**	3.27468
1.25	**1.13435**	2.57800	**1.18918**	2.71821	**1.24698**	2.86522	**1.30791**	3.01939	**1.37210**	3.18111
1.3	**1.34571**	2.48627	**1.41076**	2.62149	**1.47934**	2.76327	**1.55162**	2.91196	**1.62777**	3.06792
1.35	**1.54878**	2.37922	**1.62365**	2.50862	**1.70258**	2.64429	**1.78576**	2.78657	**1.87341**	2.93582
1.4	**1.74231**	2.25749	**1.82653**	2.38027	**1.91531**	2.50900	**2.00889**	2.64400	**2.10749**	2.78561
1.45	**1.92509**	2.12185	**2.01814**	2.23725	**2.11624**	2.35824	**2.21964**	2.48513	**2.32858**	2.61823
1.5	**2.09600**	1.97312	**2.19731**	2.08043	**2.30413**	2.19294	**2.41670**	2.31094	**2.53532**	2.43471
1.55	**2.25399**	1.81223	**2.36294**	1.91079	**2.47780**	2.01413	**2.59887**	2.12250	**2.72642**	2.23618
1.6	**2.39808**	1.64016	**2.51400**	1.72937	**2.63620**	1.82289	**2.76501**	1.92098	**2.90071**	2.02387
1.65	**2.52739**	1.45799	**2.64956**	1.53728	**2.77835**	1.62042	**2.91409**	1.90761	**3.05713**	1.79907
1.7	**2.64111**	1.26682	**2.76878**	1.33572	**2.90337**	1.40796	**3.04522**	1.48372	**3.19469**	1.56318
1.75	**2.73855**	1.06784	**2.87093**	1.12592	**3.01049**	1.18681	**3.15757**	1.25067	**3.31255**	1.31766
1.8	**2.81911**	0.86229	**2.95538**	0.90918	**3.09904**	0.95835	**3.25045**	1.00992	**3.41000**	1.06401
1.85	**2.88229**	0.65141	**3.02161**	0.68684	**3.16850**	0.72398	**3.32330**	0.76294	**3.48641**	0.80380
1.9	**2.92769**	0.43652	**3.06921**	0.46026	**3.21841**	0.48627	**3.37565**	0.51125	**3.54134**	0.53864
1.95	**2.95505**	0.21893	**3.09789**	0.23084	**3.24848**	0.24332	**3.40719**	0.25642	**3.57443**	0.27015
2.0	**2.96419**	0.00	**3.10747**	0.00	**3.25853**	0.00	**3.41773**	0.00	**3.58548**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(1.8 + i\,\underline{0.2}) = 2.95538 + i\,0.90918.$

$\cosh(1.8 + i\,\underline{2.0}) = -3.10747 + i\,0.$

q	$x = 2.0$		$x = 2.05$		$x = 2.1$		$x = 2.15$		$x = 2.2$	
0	3.76220	0.00	3.94832	0.00	4.14431	0.00	4.35067	0.00	4.56791	0.00
0.05	3.75059	0.28456	3.93615	0.29968	4.13154	0.31555	4.33726	0.33221	4.55382	0.34970
0.1	3.71587	0.56737	3.89971	0.59751	4.09329	0.62916	4.29711	0.66237	4.51167	0.69724
0.15	3.65825	0.84667	3.83923	0.89166	4.02981	0.93888	4.23046	0.98845	4.44170	1.04049
0.2	3.57806	1.12076	3.75507	1.18032	3.94148	1.24282	4.13773	1.30844	4.34433	1.37732
0.25	3.47581	1.38794	3.64777	1.46169	3.82885	1.53910	4.01950	1.62035	4.22019	1.70566
0.3	3.35214	1.64656	3.51798	1.73405	3.69261	1.82589	3.87647	1.92228	4.07003	2.02349
0.35	3.20780	1.89503	3.36649	1.99573	3.53361	2.10142	3.70956	2.21236	3.89478	2.32883
0.4	3.04368	2.13182	3.19426	2.24509	3.35283	2.36399	3.51977	2.48879	3.69552	2.61982
0.45	2.86080	2.35546	3.00232	2.48062	3.15137	2.61199	3.30828	2.74988	3.47347	2.89466
0.5	2.66027	2.56458	2.79188	2.70085	2.93048	2.84389	3.07639	2.99402	3.23000	3.15165
0.55	2.44335	2.75789	2.56423	2.90443	2.69152	3.05825	2.82553	3.21970	2.96661	3.38921
0.6	2.21136	2.93420	2.32076	3.09011	2.43597	3.25376	2.55726	3.42553	2.68495	3.60588
0.65	1.96574	3.09241	2.06299	3.23673	2.16540	3.42920	2.27322	3.61024	2.38672	3.80031
0.7	1.70800	3.23156	1.79250	3.40327	1.88148	3.58351	1.97516	3.77269	2.07379	3.97131
0.75	1.43973	3.35078	1.51096	3.52883	1.58596	3.71571	1.66493	3.91188	1.74806	4.11783
0.8	1.16258	3.44935	1.22010	3.63264	1.28066	3.82501	1.34443	4.02695	1.41156	4.23896
0.85	0.87827	3.52666	0.92172	3.71404	0.96747	3.91074	1.01564	4.11720	1.06636	4.33396
0.9	0.58854	3.58221	0.61765	3.77256	0.64831	3.97235	0.68059	4.18206	0.71458	4.40223
0.95	0.29518	3.61568	0.30978	3.80781	0.32516	4.00946	0.34135	4.22113	0.35839	4.44337
1.0	0.00	3.62686	0.00	3.81958	0.00	4.02186	0.00	4.23419	0.00	4.45711
1.05	**0.29518**	3.61568	**0.30978**	3.80781	**0.32516**	4.00946	**0.34135**	4.22113	**0.35839**	4.44337
1.1	**0.58854**	3.58221	**0.61765**	3.77256	**0.64831**	3.97235	**0.68059**	4.18206	**0.71458**	4.40223
1.15	**0.87827**	3.52666	**0.92172**	3.71404	**0.96747**	3.91074	**1.01564**	4.11720	**1.06636**	4.33396
1.2	**1.16258**	3.44935	**1.22010**	3.63264	**1.28066**	3.82501	**1.34443**	4.02695	**1.41156**	4.23896
1.25	**1.43973**	3.35078	**1.51096**	3.52883	**1.58596**	3.71571	**1.66493**	3.91188	**1.74806**	4.11783
1.3	**1.70800**	3.23156	**1.79250**	3.40327	**1.88148**	3.58351	**1.97516**	3.77269	**2.07379**	3.97131
1.35	**1.96574**	3.09241	**2.06299**	3.23673	**2.16540**	3.42920	**2.27322**	3.61024	**2.38672**	3.80031
1.4	**2.21136**	2.93420	**2.32076**	3.09011	**2.43597**	3.25376	**2.55726**	3.42553	**2.68495**	3.60588
1.45	**2.44335**	2.75789	**2.56423**	2.90443	**2.69152**	3.05825	**2.82553**	3.21970	**2.96661**	3.38921
1.5	**2.66027**	2.56458	**2.79188**	2.70085	**2.93048**	2.84389	**3.07639**	2.99402	**3.23000**	3.15165
1.55	**2.86080**	2.35546	**3.00232**	2.48062	**3.15137**	2.61199	**3.30828**	2.74988	**3.47347**	2.89466
1.6	**3.04368**	2.13182	**3.19426**	2.24509	**3.35283**	2.36399	**3.51977**	2.48879	**3.69552**	2.61982
1.65	**3.20780**	1.89503	**3.36649**	1.99573	**3.53361**	2.10142	**3.70956**	2.21236	**3.89478**	2.32883
1.7	**3.35214**	1.64656	**3.51798**	1.73405	**3.69261**	1.82589	**3.87647**	1.92228	**4.07003**	2.02349
1.75	**3.47581**	1.38794	**3.64777**	1.46169	**3.82885**	1.53910	**4.01950**	1.62035	**4.22019**	1.70566
1.8	**3.57806**	1.12076	**3.75507**	1.18032	**3.94148**	1.24282	**4.13773**	1.30844	**4.34433**	1.37732
1.85	**3.65825**	0.84667	**3.83923**	0.89166	**4.02981**	0.93888	**4.23046**	0.98845	**4.44170**	1.04049
1.9	**3.71587**	0.56737	**3.89971**	0.59751	**4.09329**	0.62916	**4.29711**	0.66237	**4.51167**	0.69724
1.95	**3.75059**	0.28456	**3.93615**	0.29968	**4.13154**	0.31555	**4.33726**	0.33221	**4.55382**	0.34970
2.0	**3.76220**	0.00	**3.94832**	0.00	**4.14431**	0.00	**4.35067**	0.00	**4.56791**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(2.1 + i\,\underline{0.8}) = 1.28066 + i\,3.82501$.
cosh $(2.2 + i\,\underline{1.25}) = -1.74806 + i\,4.11783$.

q	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
0	4.79657	0.00	5.03722	0.00	5.29047	0.00	5.55695	0.00	5.83732	0.00
0.05	4.78178	0.36807	5.02169	0.38735	5.27416	0.40760	5.53981	0.42888	5.81933	0.45122
0.1	4.73751	0.73386	4.97521	0.77231	5.22533	0.81269	5.48853	0.85511	5.76545	0.89966
0.15	4.66404	1.09513	4.89805	1.15251	5.14429	1.21277	5.40341	1.27607	5.67603	1.34255
0.2	4.56181	1.44965	4.79058	1.52560	5.03153	1.60537	5.28496	1.68916	5.55162	1.77716
0.25	4.43145	1.79523	4.65378	1.88930	4.88776	1.98808	5.13394	2.09184	5.39298	2.20082
0.3	4.27377	2.12975	4.48820	2.24134	4.71384	2.35853	4.95127	2.48162	5.20109	2.61091
0.35	4.08975	2.45113	4.29494	2.57956	4.51087	2.71443	4.73808	2.85610	4.97713	3.00490
0.4	3.88050	2.75740	4.07520	2.90188	4.28008	3.05360	4.49567	3.21297	4.72249	3.38036
0.45	3.64734	3.04677	3.83034	3.20630	4.02290	3.37395	4.22554	3.55003	4.43873	3.73499
0.5	3.39168	3.31716	3.56185	3.49096	3.74093	3.67351	3.92935	3.86521	4.12761	4.06659
0.55	3.11512	3.56719	3.27141	3.75410	3.43588	3.95038	3.60894	4.15656	3.79104	4.37311
0.6	2.81935	3.79523	2.96081	3.99409	3.10966	4.20292	3.26629	4.42228	3.43109	4.65268
0.65	2.50620	3.99987	2.63194	4.20946	2.76426	4.42955	2.90349	4.66073	3.04999	4.90356
0.7	2.17760	4.17986	2.28685	4.39887	2.40182	4.62887	2.52280	4.87045	2.65009	5.12420
0.75	1.83557	4.33407	1.92766	4.56116	2.02457	4.79965	2.12655	5.05014	2.23385	5.31325
0.8	1.48222	4.46157	1.55659	4.69533	1.63485	4.94083	1.71719	5.19869	1.80383	5.46955
0.85	1.11974	4.56155	1.17592	4.80056	1.23504	5.05156	1.29724	5.31521	1.36269	5.59213
0.9	0.75035	4.63341	0.78799	4.87618	0.82761	5.13114	0.86930	5.39893	0.91316	5.68022
0.95	0.37633	4.67671	0.39522	4.92174	0.41509	5.17909	0.43599	5.44938	0.45799	5.73330
1.0	0.00	4.69117	0.00	4.93696	0.00	5.19510	0.00	5.46623	0.00	5.75103
1.05	**0.37633**	4.67671	**0.39522**	4.92174	**0.41509**	5.17909	**0.43599**	5.44938	**0.45799**	5.73330
1.1	**0.75035**	4.63341	**0.78799**	4.87618	**0.82761**	5.13114	**0.86930**	5.39893	**0.91316**	5.68022
1.15	**1.11974**	4.56155	**1.17592**	4.80056	**1.23504**	5.05156	**1.29724**	5.31521	**1.36269**	5.59213
1.2	**1.48222**	4.46157	**1.55659**	4.69533	**1.63485**	4.94083	**1.71719**	5.19869	**1.80383**	5.46955
1.25	**1.83557**	4.33407	**1.92766**	4.56116	**2.02457**	4.79965	**2.12655**	5.05014	**2.23385**	5.31325
1.3	**2.17760**	4.17986	**2.28685**	4.39887	**2.40182**	4.62887	**2.52280**	4.87045	**2.65009**	5.12420
1.35	**2.50620**	3.99987	**2.63194**	4.20946	**2.76426**	4.42955	**2.90349**	4.66073	**3.04999**	4.90356
1.4	**2.81935**	3.79523	**2.96081**	3.99409	**3.10966**	4.20292	**3.26629**	4.42228	**3.43109**	4.65268
1.45	**3.11512**	3.56719	**3.27141**	3.75410	**3.43588**	3.95038	**3.60894**	4.15656	**3.79104**	4.37311
1.5	**3.39168**	3.31716	**3.56185**	3.49096	**3.74093**	3.67351	**3.92935**	3.86521	**4.12761**	4.06659
1.55	**3.64734**	3.04677	**3.83034**	3.20630	**4.02290**	3.37395	**4.22554**	3.55003	**4.43873**	3.73499
1.6	**3.88050**	2.75740	**4.07520**	2.90188	**4.28008**	3.05360	**4.49567**	3.21297	**4.72249**	3.38036
1.65	**4.08975**	2.45113	**4.29494**	2.57956	**4.51087**	2.71443	**4.73808**	2.85610	**4.97713**	3.00490
1.7	**4.27377**	2.12975	**4.48820**	2.24134	**4.71384**	2.35853	**4.95127**	2.48162	**5.20109**	2.61091
1.75	**4.43145**	1.79523	**4.65378**	1.88930	**4.88776**	1.98808	**5.13394**	2.09184	**5.39298**	2.20082
1.8	**4.56181**	1.44965	**4.79058**	1.52560	**5.03153**	1.60537	**5.28496**	1.68916	**5.55162**	1.77716
1.85	**4.66404**	1.09513	**4.89805**	1.15251	**5.14429**	1.21277	**5.40341**	1.27607	**5.67603**	1.34255
1.9	**4.73751**	0.73386	**4.97521**	0.77231	**5.22533**	0.81269	**5.48853**	0.85511	**5.76545**	0.89966
1.95	**4.78178**	0.36807	**5.02169**	0.38735	**5.27416**	0.40760	**5.53981**	0.42888	**5.81933**	0.45122
2.0	**4.79657**	0.00	**5.03722**	0.00	**5.29047**	0.00	**5.55695**	0.00	**5.83732**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh (2.4 + i\,\underline{0.4}) = 4.49567 + i\,3.21297.$
$\cosh (2.4 + i\,\underline{1.5}) = -3.92935 + i\,3.86521$

q	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
0	6.13229	0.00	6.44259	0.00	6.76901	0.00	7.11234	0.00	7.47347	0.00
0.05	6.11339	0.47469	6.42273	0.49935	6.74814	0.52526	7.09042	0.55249	7.45043	0.58109
0.1	6.05680	0.94646	6.36327	0.99563	6.68567	1.04729	7.02478	1.10156	7.38146	1.15859
0.15	5.96287	1.41239	6.26458	1.48577	6.58199	1.56285	6.91583	1.64385	7.26697	1.72896
0.2	5.83215	1.86961	6.12727	1.96674	6.43770	2.06878	6.76424	2.17600	7.10769	2.28866
0.25	5.66550	2.31531	5.95218	2.43559	6.25374	2.56196	6.57095	2.69474	6.90458	2.83425
0.3	5.46392	2.74674	5.74039	2.88943	6.03123	3.03934	6.33714	3.19686	6.65891	3.36237
0.35	5.22864	3.16122	5.49321	3.32545	5.77153	3.49799	6.06427	3.67927	6.37218	3.86976
0.4	4.96113	3.55622	5.21217	3.74097	5.47624	3.93506	5.75401	4.13900	6.04606	4.35329
0.45	4.66304	3.92929	4.89898	4.13342	5.14719	4.34788	5.40827	4.57321	5.68287	4.80998
0.5	4.33619	4.27814	4.55560	4.50039	4.78641	4.73389	5.02919	4.97923	5.28454	5.23702
0.55	3.98260	4.60062	4.18413	4.83961	4.39612	5.09071	4.61910	5.35454	4.85363	5.63177
0.6	3.60448	4.89472	3.78686	5.14900	3.97872	5.41615	4.18053	5.69685	4.39279	5.99179
0.65	3.20411	5.15865	3.36624	5.42664	3.53680	5.70819	3.71619	6.00403	3.90488	6.31488
0.7	2.78401	5.39077	2.92488	5.67082	3.07306	5.96505	3.22894	6.27419	3.39288	6.59903
0.75	2.34673	5.58966	2.46547	5.88004	2.59039	6.18512	2.72178	6.50567	2.85997	6.84249
0.8	1.89498	5.75408	1.99087	6.05301	2.09174	6.36706	2.19784	6.69705	2.30943	7.04377
0.85	1.43155	5.88304	1.50399	6.18866	1.58019	6.50976	1.66034	6.84713	1.74465	7.20163
0.9	0.95930	5.97572	1.00784	6.28615	1.05891	6.61231	1.11262	6.95500	1.16911	7.31508
0.95	0.48113	6.03155	0.50548	6.34489	0.53109	6.67409	0.55803	7.01998	0.58636	7.38343
1.0	**0.00**	6.05020	**0.00**	6.36451	**0.00**	6.69473	**0.00**	7.04169	**0.00**	7.40626
1.05	**0.48113**	6.03155	**0.50548**	6.34489	**0.53109**	6.67409	**0.55803**	7.01998	**0.58636**	7.38343
1.1	**0.95930**	5.97572	**1.00784**	6.28615	**1.05891**	6.61231	**1.11262**	6.95500	**1.16911**	7.31508
1.15	**1.43155**	5.88304	**1.50399**	6.18866	**1.58019**	6.50976	**1.66034**	6.84713	**1.74465**	7.20163
1.2	**1.89498**	5.75408	**1.99087**	6.05301	**2.09174**	6.36706	**2.19784**	6.69705	**2.30943**	7.04377
1.25	**2.34673**	5.58966	**2.46547**	5.88004	**2.59039**	6.18512	**2.72178**	6.50567	**2.85997**	6.84249
1.3	**2.78401**	5.39077	**2.92488**	5.67082	**3.07306**	5.96505	**3.22894**	6.27419	**3.39288**	6.59903
1.35	**3.20411**	5.15865	**3.36624**	5.42664	**3.53680**	5.70819	**3.71619**	6.00403	**3.90488**	6.31488
1.4	**3.60448**	4.89472	**3.78686**	5.14900	**3.97872**	5.41615	**4.18053**	5.69685	**4.39279**	5.99179
1.45	**3.98260**	4.60062	**4.18413**	4.83961	**4.39612**	5.09071	**4.61910**	5.35454	**4.85363**	5.63177
1.5	**4.33619**	4.27814	**4.55560**	4.50039	**4.78641**	4.73389	**5.02919**	4.97923	**5.28454**	5.23702
1.55	**4.66304**	3.92929	**4.89898**	4.13342	**5.14719**	4.34788	**5.40827**	4.57321	**5.68287**	4.80998
1.6	**4.96113**	3.55622	**5.21217**	3.74097	**5.47624**	3.93506	**5.75401**	4.13900	**6.04606**	4.35329
1.65	**5.22864**	3.16122	**5.49321**	3.32545	**5.77153**	3.49799	**6.06427**	3.67927	**6.37218**	3.86976
1.7	**5.46392**	2.74674	**5.74039**	2.88943	**6.03123**	3.03934	**6.33714**	3.19686	**6.65891**	3.36237
1.75	**5.66550**	2.31531	**5.95218**	2.43559	**6.25374**	2.56196	**6.57095**	2.69474	**6.90458**	2.83425
1.8	**5.83215**	1.86961	**6.12727**	1.96674	**6.43770**	2.06878	**6.76424**	2.17600	**7.10769**	2.28866
1.85	**5.96287**	1.41239	**6.26458**	1.48577	**6.58199**	1.56285	**6.91583**	1.64385	**7.26697**	1.72896
1.9	**6.05680**	0.94646	**6.36327**	0.99563	**6.68567**	1.04729	**7.02478**	1.10156	**7.38146**	1.15859
1.95	**6.11339**	0.47469	**6.42273**	0.49935	**6.74814**	0.52526	**7.09042**	0.55249	**7.45043**	0.58109
2.0	**6.13229**	0.00	**6.44259**	0.00	**6.76901**	0.00	**7.11234**	0.00	**7.47347**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(2.7 + i\,\underline{1.00}) = 0 + i\,7.40626$.
cosh $(2.6 + i\,\underline{1.2}) = -2.09174 + i\,6.36706$.

Table VIII. HYPERBOLIC COSINES. cosh $(x + iq) = u + iv$. Continued

q	x = 2.75		x = 2.80		x = 2.85		x = 2.90		x = 2.95	
0	7.85328	0.00	8.25273	0.00	8.67281	0.00	9.11458	0.00	9.57915	0.00
0.05	7.82907	0.61115	8.22728	0.64273	8.64608	0.67592	9.08649	0.71081	9.54962	0.74747
0.1	7.75659	1.21852	8.15112	1.28150	8.56604	1.34768	9.00237	1.41723	9.46121	1.49032
0.15	7.63629	1.81839	8.02470	1.91237	8.43318	2.01112	8.86275	2.11491	9.31447	2.22399
0.2	7.46891	2.40704	7.84881	2.53144	8.24834	2.66217	8.66850	2.79956	9.11031	2.94395
0.25	7.25548	2.98086	7.62452	3.13491	8.01263	3.29681	8.42078	3.46694	8.84998	3.64575
0.3	6.99732	3.53629	7.35323	3.71905	7.72754	3.91112	8.12115	4.11295	8.53508	4.32508
0.35	6.69602	4.06993	7.03661	4.28026	7.39479	4.50131	7.77146	4.73361	8.16757	4.97774
0.4	6.35344	4.57847	6.67660	4.81509	7.01646	5.06375	7.37385	5.32508	7.74969	5.63048
0.45	5.97168	5.05878	6.27542	5.32022	6.59486	5.59498	6.93078	5.88371	7.28404	6.18717
0.5	5.55311	5.50790	5.83556	5.79256	6.13261	6.09170	6.44498	6.40608	6.77348	6.73647
0.55	5.10030	5.92307	5.35972	6.22918	5.63254	6.55088	5.91945	6.88894	6.22116	7.24424
0.6	4.61604	6.30172	4.85083	6.62740	5.09775	6.96966	5.35742	7.32934	5.63048	7.70735
0.65	4.10333	6.64151	4.31204	6.98476	4.53153	7.34547	4.76236	7.72455	5.00509	8.12294
0.7	3.56531	6.94036	3.74666	7.29905	3.93738	7.67599	4.13793	8.07213	4.34884	8.48845
0.75	3.00532	7.19642	3.15818	7.56834	3.31894	7.95919	3.48800	8.36994	3.66578	8.80162
0.8	2.42680	7.40811	2.55023	7.79098	2.68005	8.19332	2.81656	8.61616	2.96012	9.06053
0.85	1.83331	7.57413	1.92656	7.96557	2.02463	8.37694	2.12776	8.80924	2.23621	9.26358
0.9	1.22852	7.69345	1.29101	8.09106	1.35673	8.50891	1.42583	8.94802	1.49851	9.40952
0.95	0.61616	7.76534	0.64750	8.16666	0.68046	8.58841	0.71512	9.03163	0.75157	9.49744
1.0	**0.00**	7.78935	**0.00**	8.19192	**0.00**	8.61497	**0.00**	9.05956	**0.00**	9.52681
1.05	**0.61616**	7.76534	**0.64750**	8.16666	**0.68046**	8.58841	**0.71512**	9.03163	**0.75157**	9.49744
1.1	**1.22852**	7.69345	**1.29101**	8.09106	**1.35673**	8.50891	**1.42583**	8.94802	**1.49851**	9.40952
1.15	**1.83331**	7.57413	**1.92656**	7.96557	**2.02463**	8.37694	**2.12776**	8.80924	**2.23621**	9.26358
1.2	**2.42680**	7.40811	**2.55023**	7.79098	**2.68005**	8.19332	**2.81656**	8.61616	**2.96012**	9.06053
1.25	**3.00532**	7.19642	**3.15818**	7.56834	**3.31894**	7.95919	**3.48800**	8.36994	**3.66578**	8.80162
1.3	**3.56531**	6.94036	**3.74666**	7.29905	**3.93738**	7.67599	**4.13793**	8.07213	**4.34884**	8.48845
1.35	**4.10333**	6.64151	**4.31204**	6.98476	**4.53153**	7.34547	**4.76236**	7.72455	**5.00509**	8.12294
1.4	**4.61604**	6.30172	**4.85083**	6.62740	**5.09775**	6.96966	**5.35742**	7.32934	**5.63048**	7.70735
1.45	**5.10030**	5.92307	**5.35972**	6.22918	**5.63254**	6.55088	**5.91945**	6.88894	**6.22116**	7.24424
1.5	**5.55311**	5.50790	**5.83556**	5.79256	**6.13261**	6.09170	**6.44498**	6.40608	**6.77348**	6.73647
1.55	**5.97168**	5.05878	**6.27542**	5.32022	**6.59486**	5.59498	**6.93078**	5.88371	**7.28404**	6.18717
1.6	**6.35344**	4.57847	**6.67660**	4.81509	**7.01646**	5.06375	**7.37385**	5.32508	**7.74969**	5.63048
1.65	**6.69602**	4.06993	**7.03661**	4.28026	**7.39479**	4.50131	**7.77146**	4.73361	**8.16757**	4.97774
1.7	**6.99732**	3.53629	**7.35323**	3.71905	**7.72754**	3.91112	**8.12115**	4.11295	**8.53508**	4.32508
1.75	**7.25548**	2.98086	**7.62452**	3.13491	**8.01263**	3.29681	**8.42078**	3.46694	**8.84998**	3.64575
1.8	**7.46891**	2.40704	**7.84881**	2.53144	**8.24834**	2.66217	**8.66850**	2.79956	**9.11031**	2.94395
1.85	**7.63629**	1.81839	**8.02470**	1.91237	**8.43318**	2.01112	**8.86275**	2.11491	**9.31447**	2.22399
1.9	**7.75659**	1.21852	**8.15112**	1.28150	**8.56604**	1.34768	**9.00237**	1.41723	**9.46121**	1.49032
1.95	**7.82907**	0.61115	**8.22728**	0.64273	**8.64608**	0.67592	**9.08649**	0.71081	**9.54962**	0.74747
2.0	**7.85328**	0.00	**8.25273**	0.00	**8.67281**	0.00	**9.11458**	0.00	**9.57915**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(2.95 + i\,0) = 9.57915 + i\,0.$
$\cosh(2.8 + i\,\underline{1.2}) = -2.55023 + i\,7.79098.$

TABLE VIII. HYPERBOLIC COSINES. $\cosh(x + iq) = u + iv$. CONTINUED

q	$x = 3.0$		$x = 3.05$		$x = 3.10$		$x = 3.15$		$x = 3.20$	
0	10.06766	0.00	10.58135	0.00	11.12150	0.00	11.68946	0.00	12.28665	0.00
0.05	10.03660	0.78599	10.54870	0.82649	11.08720	0.86905	11.65340	0.91378	12.24880	0.96080
0.1	9.94371	1.56714	10.45110	1.64788	10.98460	1.73274	11.54550	1.82193	12.13540	1.91568
0.15	9.78949	2.33863	10.28900	2.45911	10.81420	2.58575	11.36650	2.71885	11.94720	2.85874
0.2	9.57492	3.09569	10.06350	3.25518	10.57720	3.42281	11.11730	3.59900	11.68530	3.78419
0.25	9.30131	3.83368	9.77589	4.03120	10.27490	4.23878	10.79970	4.45696	11.35140	4.68630
0.3	8.97035	4.54806	9.42805	4.78233	9.90933	5.02860	10.41540	5.28745	10.94750	5.55952
0.35	8.58409	5.23433	9.02209	5.50400	9.48264	5.78743	9.96690	6.08533	10.47610	6.39846
0.4	8.14491	5.88836	8.56049	6.19173	8.99749	6.51058	9.45697	6.84570	9.94011	7.19795
0.45	7.65551	6.50609	8.04612	6.84128	8.45686	7.19358	8.88873	7.56387	9.34284	7.95306
0.5	7.11891	7.08371	7.48215	7.44866	7.86409	7.83223	8.26570	8.23539	8.68797	8.65915
0.55	6.53842	7.61765	6.87204	8.01011	7.22284	8.42260	7.59170	8.85615	7.97954	9.31184
0.6	5.91762	8.10463	6.21956	8.52218	6.53705	8.96104	6.87089	9.42230	7.22191	9.90712
0.65	5.26034	8.54164	5.52874	8.98171	5.81097	9.44423	6.10773	9.93036	6.41976	10.44130
0.7	4.57062	8.92599	4.80383	9.38586	5.04906	9.86919	5.30690	10.37720	5.57802	10.91120
0.75	3.85273	9.25531	4.04931	9.73216	4.25602	10.23330	4.47336	10.76010	4.70190	11.31370
0.8	3.11108	9.52757	3.26982	10.01840	3.43673	10.53430	3.61224	11.07660	3.79678	11.64650
0.85	2.35025	9.74108	2.47017	10.24290	2.59626	10.77040	2.72885	11.32480	2.86826	11.90750
0.9	1.57493	9.89454	1.65529	10.40430	1.73979	10.94010	1.82863	11.50320	1.92205	12.09510
0.95	0.78990	9.98699	0.83020	10.50150	0.87258	11.04230	0.91714	11.61070	0.96400	12.20810
1.0	**0.00**	10.01787	**0.00**	10.53399	**0.00**	11.07645	**0.00**	11.64661	**0.00**	12.24588
1.05	**0.78990**	9.98699	**0.83020**	10.50150	**0.87258**	11.04230	**0.91714**	11.61070	**0.96400**	12.20810
1.1	**1.57493**	9.89454	**1.65529**	10.40430	**1.73979**	10.94010	**1.82863**	11.50320	**1.92205**	12.09510
1.15	**2.35025**	9.74108	**2.47017**	10.24290	**2.59626**	10.77040	**2.72885**	11.32480	**2.86826**	11.90750
1.2	**3.11108**	9.52757	**3.26982**	10.01840	**3.43673**	10.53430	**3.61224**	11.07660	**3.79678**	11.64650
1.25	**3.85273**	9.25531	**4.04931**	9.73216	**4.25602**	10.23330	**4.47336**	10.76010	**4.70190**	11.31370
1.3	**4.57062**	8.92599	**4.80383**	9.38586	**5.04906**	9.86919	**5.30690**	10.37720	**5.57802**	10.91120
1.35	**5.26034**	8.54164	**5.52874**	8.98171	**5.81097**	9.44423	**6.10773**	9.93036	**6.41976**	10.44130
1.4	**5.91762**	8.10463	**6.21956**	8.52218	**6.53705**	8.96104	**6.87089**	9.42230	**7.22191**	9.90712
1.45	**6.53842**	7.61765	**6.87204**	8.01011	**7.22284**	8.42260	**7.59170**	8.85615	**7.97954**	9.31184
1.5	**7.11891**	7.08371	**7.48215**	7.44866	**7.86409**	7.83223	**8.26570**	8.23539	**8.68797**	8.65915
1.55	**7.65551**	6.50609	**8.04612**	6.84128	**8.45686**	7.19358	**8.88873**	7.56387	**9.34284**	7.95306
1.6	**8.14491**	5.88836	**8.56049**	6.19173	**8.99749**	6.51058	**9.45697**	6.84570	**9.94011**	7.19795
1.65	**8.58409**	5.23433	**9.02209**	5.50400	**9.48264**	5.78743	**9.96690**	6.08533	**10.47610**	6.39846
1.7	**8.97035**	4.54806	**9.42805**	4.78233	**9.90933**	5.02860	**10.41540**	5.28745	**10.94750**	5.55952
1.75	**9.30131**	3.83368	**9.77589**	4.03120	**10.27490**	4.23878	**10.79970**	4.45696	**11.35140**	4.68630
1.8	**9.57492**	3.09569	**10.06350**	3.25518	**10.57720**	3.42281	**11.11730**	3.59900	**11.68530**	3.78419
1.85	**9.78949**	2.33863	**10.28900**	2.45911	**10.81420**	2.58575	**11.36650**	2.71885	**11.94720**	2.85874
1.9	**9.94371**	1.56714	**10.45110**	1.64788	**10.98460**	1.73274	**11.54550**	1.82193	**12.13540**	1.91568
1.95	**10.03660**	0.78599	**10.54870**	0.82649	**11.08720**	0.86905	**11.65340**	0.91378	**12.24880**	0.96080
2.0	**10.06766**	0.00	**10.58135**	0.00	**11.12150**	0.00	**11.68946**	0.00	**12.28665**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(3.10 + i\,\underline{0.5}) = 7.86409 + i\,7.83223$.
$\cosh(3.10 + i\,\underline{1.55}) = -8.45686 + i\,7.19358$.

q	$x = 3.25$		$x = 3.30$		$x = 3.35$		$x = 3.40$		$x = 3.45$	
0	12.91456	0.00	13.57476	0.00	14.26891	0.00	14.99874	0.00	15.76607	0.00
0.05	12.87474	1.01022	13.53290	1.06217	14.22498	1.11677	14.95250	1.17417	15.71746	1.23450
0.1	12.75555	2.01422	13.40764	2.11780	14.09323	2.22666	14.81410	2.34110	15.57196	2.46139
0.15	12.55773	3.00579	13.19970	3.16036	13.87465	3.32282	14.58432	3.49359	15.33045	3.67311
0.2	12.28247	3.97883	12.91035	4.18343	13.57054	4.39850	14.26465	4.62455	14.99442	4.86217
0.25	11.93150	4.92735	12.54145	5.18072	13.18275	5.44705	13.85702	5.72700	14.56595	6.02127
0.3	11.50695	5.84548	12.09520	6.14670	12.71369	6.46202	13.36397	6.79414	14.04764	7.14324
0.35	11.01147	6.72758	11.57440	7.07352	12.16623	7.43715	12.78852	7.81938	13.44278	8.22116
0.4	10.44810	7.56820	10.98222	7.95737	11.54379	8.36643	12.13423	8.79642	12.75501	9.24840
0.45	9.82031	8.36217	10.32233	8.79215	10.85016	9.24413	11.40512	9.71923	11.98861	10.21863
0.5	9.13197	9.10456	9.59881	9.57273	10.08964	10.06483	10.60570	10.58212	11.14830	11.12585
0.55	8.38733	9.79082	8.81610	10.29428	9.26691	10.82349	9.74090	11.37975	10.23924	11.96447
0.6	7.59099	10.41673	7.97905	10.95235	8.38705	11.51541	8.81604	12.10723	9.26706	12.72933
0.65	6.74784	10.97841	7.09279	11.54294	7.45549	12.13633	7.83682	12.76006	8.23775	13.41572
0.7	5.86309	11.47240	6.16381	12.06234	6.47795	12.68244	6.80928	13.33423	7.15765	14.01940
0.75	4.94218	11.89566	5.19485	12.50736	5.46075	13.15033	5.73977	13.82620	6.03341	14.53662
0.8	3.99082	12.24560	4.19483	12.87530	4.40933	13.53717	4.63487	14.23291	4.87198	14.96423
0.85	3.01484	12.52002	3.16897	13.16388	3.33101	13.84054	3.50139	14.55188	3.68053	15.29960
0.9	2.02028	12.71726	2.21356	13.37120	2.23215	14.05851	2.34632	14.78111	2.46636	15.54061
0.95	1.01326	12.83610	1.06507	13.49615	1.11953	14.18950	1.17679	14.91923	1.23699	15.68581
1.0	0.00	12.87578	0.00	13.53788	0.00	14.23382	0.00	14.96536	0.00	15.73432
1.05	**1.01326**	12.83610	**1.06507**	13.49615	**1.11953**	14.18950	**1.17679**	14.91923	**1.23699**	15.68581
1.1	**2.02028**	12.71726	**2.12356**	13.37120	**2.23215**	14.05851	**2.34632**	14.78111	**2.46636**	15.54061
1.15	**3.01484**	12.52002	**3.16897**	13.16388	**3.33101**	13.84054	**3.50139**	14.55188	**3.68053**	15.29960
1.2	**3.99082**	12.24560	**4.19483**	12.87530	**4.40933**	13.53717	**4.63487**	14.23291	**4.87198**	14.96423
1.25	**4.94218**	11.89566	**5.19485**	12.50736	**5.46075**	13.15033	**5.73977**	13.82620	**6.03341**	14.53662
1.3	**5.86309**	11.47240	**6.16381**	12.06234	**6.47795**	12.68244	**6.80928**	13.33423	**7.15765**	14.01940
1.35	**6.74784**	10.97841	**7.09279**	11.54294	**7.45549**	12.13633	**7.83682**	12.76006	**8.23775**	13.41572
1.4	**7.59099**	10.41673	**7.97905**	10.95235	**8.38705**	11.51541	**8.81604**	12.10723	**9.26706**	12.72933
1.45	**8.38733**	9.79082	**8.81610**	10.29428	**9.26691**	10.82349	**9.74090**	11.37975	**10.23924**	11.96447
1.5	**9.13197**	9.10456	**9.59881**	9.57273	**10.08964**	10.06483	**10.60570**	10.58212	**11.14830**	11.12585
1.55	**9.82031**	8.36217	**10.32233**	8.79215	**10.85016**	9.24413	**11.40512**	9.71923	**11.98861**	10.21863
1.6	**10.44810**	7.56820	**10.98222**	7.95737	**11.54379**	8.36643	**12.13423**	8.79642	**12.75501**	9.24840
1.65	**11.01147**	6.72758	**11.57440**	7.07352	**12.16623**	7.43715	**12.78852**	7.81938	**13.44278**	8.22116
1.7	**11.50695**	5.84548	**12.09520**	6.14670	**12.71369**	6.46202	**13.36397**	6.79414	**14.04764**	7.14324
1.75	**11.93150**	4.92735	**12.54145**	5.18072	**13.18275**	5.44705	**13.85702**	5.72700	**14.56595**	6.02127
1.8	**12.28247**	3.97883	**12.91035**	4.18343	**13.57054**	4.39850	**14.26465**	4.62455	**14.99442**	4.86217
1.85	**12.55773**	3.00579	**13.19970**	3.16036	**13.87465**	3.32282	**14.58432**	3.49359	**15.33045**	3.67311
1.9	**12.75555**	2.01422	**13.40764**	2.11780	**14.09323**	2.22666	**14.81410**	2.34110	**15.57196**	2.46139
1.95	**12.87474**	1.01022	**13.53290**	1.06217	**14.22498**	1.11677	**14.95250**	1.17417	**15.71746**	1.23450
2.0	**12.91456**	0.00	**13.57476**	0.00	**14.26891**	0.00	**14.99874**	0.00	**15.76607**	0.00

Note. Negative quantities are in heavy type.

Examples. cosh $(3.45 + i\,\underline{0.05}) = 15.71746 + i\,1.23450$.
cosh $(3.25 + i\,\underline{1.95}) = -12.87474 + i\,1.01022$.

q	x = 3.50		x = 3.55		x = 3.60		x = 3.65		x = 3.70	
0	16.57282	0.00	17.42102	0.00	18.31278	0.00	19.25033	0.00	20.23601	0.00
0.05	16.52173	1.29792	17.36731	1.36458	18.25632	1.43466	19.19100	1.50832	20.17362	1.58576
0.1	16.36878	2.58783	17.20653	2.72075	18.08732	2.86047	19.01331	3.00735	19.98688	3.16174
0.15	16.11491	3.86180	16.93970	4.06015	17.80680	4.26865	18.71843	4.48783	19.67690	4.71823
0.2	15.76170	5.11195	16.56840	5.37451	17.41650	5.65052	18.30814	5.94065	19.24560	6.24563
0.25	15.31130	6.33059	16.09492	6.65574	16.91880	6.99754	17.78497	7.35683	18.69565	7.73453
0.3	14.76650	7.51020	15.52225	7.89594	16.31680	8.30143	17.15216	8.72766	18.03040	9.17573
0.35	14.13065	8.64360	14.85386	9.08745	15.61421	9.55412	16.41360	10.04469	17.25404	10.56037
0.4	13.40770	9.72361	14.09390	10.22293	14.81535	10.74789	15.57383	11.29972	16.37127	11.87990
0.45	12.60210	10.74357	13.24705	11.29540	13.92515	11.87545	14.63806	12.48520	15.38760	13.12620
0.5	11.71820	11.69740	12.31852	12.29820	12.94910	12.92978	13.61203	13.59365	14.30902	14.29155
0.55	10.76320	12.57910	11.31405	13.22520	11.89320	13.90436	12.50208	14.61830	13.14223	15.36878
0.6	9.74126	13.38330	10.23982	14.07066	10.76400	14.79326	11.31505	15.55281	11.89444	16.35127
0.65	8.65928	14.10490	9.10246	14.82933	9.56840	15.59090	10.05827	16.39143	10.57330	17.23295
0.7	7.52391	14.73960	7.90898	15.49665	8.31383	16.29246	8.73946	17.12900	9.18696	18.00840
0.75	6.34215	15.28340	6.66674	16.06840	7.00800	16.89356	7.36678	17.76096	7.74399	18.67280
0.8	5.12129	15.73300	5.38339	16.54105	5.65896	17.39050	5.94868	18.28342	6.25327	19.22208
0.85	3.86885	16.08555	4.06686	16.91175	4.27503	17.78022	4.49390	18.69316	4.72401	19.65290
0.9	2.59256	16.33896	2.72525	17.17817	2.86475	18.06033	3.01142	18.98765	3.16561	19.96246
0.95	1.30029	16.49163	1.36684	17.33870	1.43680	18.22900	1.51036	19.16506	1.58770	20.14900
1.0	0.00	16.54263	0.00	17.39230	0.00	18.28546	0.00	19.22434	0.00	20.21129
1.05	**1.30029**	16.49163	**1.36684**	17.33870	**1.43680**	18.22900	**1.51036**	19.16506	**1.58770**	20.14900
1.1	**2.59256**	16.33896	**2.72525**	17.17817	**2.86475**	18.06033	**3.01142**	18.98765	**3.16561**	19.96246
1.15	**3.86885**	16.08555	**4.06686**	16.91175	**4.27503**	17.78022	**4.49390**	18.69316	**4.72401**	19.65290
1.2	**5.12129**	15.73300	**5.38339**	16.54105	**5.65896**	17.39050	**5.94868**	18.28342	**6.25327**	19.22208
1.25	**6.34215**	15.28340	**6.66674**	16.06840	**7.00800**	16.89356	**7.36678**	17.76096	**7.74399**	18.67280
1.3	**7.52391**	14.73960	**7.90898**	15.49665	**8.31383**	16.29246	**8.73946**	17.12900	**9.18696**	18.00840
1.35	**8.65928**	14.10490	**9.10246**	14.82933	**9.56840**	15.59090	**10.05827**	16.39143	**10.57330**	17.23295
1.4	**9.74126**	13.38330	**10.23982**	14.07066	**10.76400**	14.79326	**11.31505**	15.55281	**11.89444**	16.35127
1.45	**10.76320**	12.57910	**11.31405**	13.22520	**11.89320**	13.90436	**12.50208**	14.61830	**13.14223**	15.36878
1.5	**11.71820**	11.69740	**12.31852**	12.29820	**12.94910**	12.92978	**13.61203**	13.59365	**14.30902**	14.29155
1.55	**12.60210**	10.74357	**13.24705**	11.29540	**13.92515**	11.87545	**14.63806**	12.48520	**15.38760**	13.12620
1.6	**13.40770**	9.72361	**14.09390**	10.22293	**14.81535**	10.74789	**15.57383**	11.29972	**16.37127**	11.87990
1.65	**14.13065**	8.64360	**14.85386**	9.08745	**15.61421**	9.55412	**16.41360**	10.04469	**17.25404**	10.56037
1.7	**14.76650**	7.51020	**15.52225**	7.89594	**16.31680**	8.30143	**17.15216**	8.72766	**18.03040**	9.17573
1.75	**15.31130**	6.33059	**16.09492**	6.65574	**16.91880**	6.99754	**17.78497**	7.35683	**18.69565**	7.73453
1.8	**15.76170**	5.11195	**16.56840**	5.37451	**17.41650**	5.65052	**18.30814**	5.94065	**19.24560**	6.24563
1.85	**16.11491**	3.86180	**16.93970**	4.06015	**17.80680**	4.26865	**18.71843**	4.48783	**19.67690**	4.71823
1.9	**16.36878**	2.58783	**17.20653**	2.72075	**18.08732**	2.86047	**19.01331**	3.00735	**19.98688**	3.16174
1.95	**16.52173**	1.29792	**17.36731**	1.36458	**18.25632**	1.43466	**19.19100**	1.50832	**20.17362**	1.58576
2.0	**16.57282**	0.00	**17.42102**	0.00	**18.31278**	0.00	**19.25033**	0.00	**20.23601**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(3.50 + i\,\underline{0.70}) = 7.52391 + i\,14.73960$.
$\cosh(3.60 + i\,\underline{1.55}) = -13.92515 + i\,11.87545$.

Table VIII. HYPERBOLIC COSINES. $\cosh(x + iq) = u + iv$. Continued

q	x = 3.75		x = 3.80		x = 3.85		x = 3.90		x = 3.95	
0	21.27230	0.00	22.36178	0.00	23.50717	0.00	24.71135	0.00	25.97731	0.00
0.05	21.20670	1.66716	22.29283	1.75273	23.43470	1.84268	24.63516	1.93724	25.89724	2.03665
0.1	21.01038	3.32404	22.08646	3.49465	23.21775	3.67400	24.40710	3.86254	25.65749	4.06074
0.15	20.68452	4.96043	21.74391	5.21503	22.85766	5.48267	24.02856	5.76402	25.25957	6.05979
0.2	20.23113	6.56624	21.26731	6.90325	22.35664	7.25754	23.50188	7.62997	24.70590	8.02149
0.25	19.65301	8.13156	20.65958	8.54892	21.71778	8.98766	22.83030	9.44887	23.99991	9.93373
0.3	18.95373	9.64674	19.92448	10.14188	20.94503	10.66233	22.01797	11.20952	23.14597	11.78474
0.35	18.13760	11.10246	19.06655	11.67230	20.04315	12.27134	21.06988	12.90106	22.14931	13.56305
0.4	17.20963	12.48971	18.09105	13.13076	19.01770	13.80465	19.99190	14.51307	21.01610	15.25776
0.45	16.17556	13.79998	17.00402	14.50828	17.87500	15.25286	18.79065	16.03558	19.75331	16.85842
0.5	15.04177	15.02516	15.81216	15.79634	16.62208	16.60702	17.47355	17.45924	18.36873	18.35512
0.55	13.81524	16.15770	14.52281	16.98701	15.26668	17.85880	16.04874	18.77526	16.87098	19.73867
0.6	12.50353	17.19062	13.14392	18.07296	13.81716	19.00048	14.52497	19.97556	15.26910	21.00052
0.65	11.11473	18.11756	11.68400	19.04746	12.28246	20.02501	12.91164	21.05272	13.57315	22.13290
0.7	9.65741	18.93280	10.15203	19.90455	10.67203	20.92608	11.21871	21.99993	11.79366	23.12881
0.75	8.14055	19.63131	8.55748	20.63891	8.99580	21.69813	9.45662	22.81160	9.94109	23.98212
0.8	6.57350	20.20879	6.91017	21.24603	7.26411	22.33640	7.63623	23.48262	8.02744	24.68760
0.85	4.96592	20.66167	5.22025	21.72216	5.48764	22.83696	5.76875	24.00888	6.06429	25.24084
0.9	3.32772	20.98716	3.49815	22.06437	3.67733	23.19673	3.86571	24.38710	4.06375	25.63849
0.95	1.66900	21.18327	1.75448	22.27052	1.84435	23.41348	1.93883	24.61500	2.03816	25.87805
1.0	**0.00**	21.24878	**0.00**	22.33941	**0.00**	23.48589	**0.00**	24.69110	**0.00**	25.95806
1.05	**1.66900**	21.18327	**1.75448**	22.27052	**1.84435**	23.41348	**1.93883**	24.61500	**2.03816**	25.87805
1.1	**3.32772**	20.98716	**3.49815**	22.06437	**3.67733**	23.19673	**3.86571**	24.38710	**4.06375**	25.63849
1.15	**4.96592**	20.66167	**5.22025**	21.72216	**5.48764**	22.83696	**5.76875**	24.00888	**6.06429**	25.24084
1.2	**6.57350**	20.20879	**6.91017**	21.24603	**7.26411**	22.33640	**7.63623**	23.48262	**8.02744**	24.68760
1.25	**8.14055**	19.63131	**8.55748**	20.63891	**8.99580**	21.69813	**9.45662**	22.81160	**9.94109**	23.98212
1.3	**9.65741**	18.93280	**10.15203**	19.90455	**10.67203**	20.92608	**11.21871**	21.99993	**11.79366**	23.12881
1.35	**11.11473**	18.11756	**11.68400**	19.04746	**12.28246**	20.02501	**12.91164**	21.05272	**13.57315**	22.13290
1.4	**12.50353**	17.19062	**13.14392**	18.07296	**13.81716**	19.00048	**14.52497**	19.97556	**15.26910**	21.00052
1.45	**13.81524**	16.15770	**14.52281**	16.98701	**15.26668**	17.85880	**16.04874**	18.77526	**16.87098**	19.73867
1.5	**15.04177**	15.02516	**15.81216**	15.79634	**16.62208**	16.60702	**17.47355**	17.45924	**18.36873**	18.35512
1.55	**16.17556**	13.79998	**17.00402**	14.50828	**17.87500**	15.25286	**18.79065**	16.03558	**19.75331**	16.85842
1.6	**17.20963**	12.48971	**18.09105**	13.13076	**19.01770**	13.80465	**19.99190**	14.51307	**21.01610**	15.25776
1.65	**18.13760**	11.10246	**19.06655**	11.67230	**20.04315**	12.27134	**21.06988**	12.90106	**22.14931**	13.56305
1.7	**18.95373**	9.64674	**19.92448**	10.14188	**20.94503**	10.66233	**22.01797**	11.20952	**23.14597**	11.78474
1.75	**19.65301**	8.13156	**20.65958**	8.54892	**21.71778**	8.98766	**22.83030**	9.44887	**23.99991**	9.93373
1.8	**20.23113**	6.56624	**21.26731**	6.90325	**22.35664**	7.25754	**23.50188**	7.62997	**24.70590**	8.02149
1.85	**20.68452**	4.96043	**21.74391**	5.21503	**22.85766**	5.48267	**24.02856**	5.76402	**25.25957**	6.05979
1.9	**21.01038**	3.32404	**22.08646**	3.49465	**23.21775**	3.67400	**24.40710**	3.86254	**25.65749**	4.06074
1.95	**21.20670**	1.66716	**22.29283**	1.75273	**23.43470**	1.84268	**24.63516**	1.93724	**25.89724**	2.03665
2.0	**21.27230**	0.00	**22.36178**	0.00	**23.50717**	0.00	**24.71135**	0.00	**25.97731**	0.00

Note. Negative quantities are in heavy type.

Examples. $\cosh(3.90 + i\,\underline{0.25}) = 22.83030 + i\,9.44887.$
$\cosh(3.75 + i\,\underline{1.25}) = -8.14055 + i\,19.63131.$

Table IX. HYPERBOLIC TANGENTS. $\tanh (x + iq) = u + iv$

q	$x = 0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
0	0.00	0.00	0.04996	0.00	0.09967	0.00	0.14889	0.00	0.19738	0.00
0.05	0.00	0.07870	0.05027	0.07850	0.10028	0.07792	0.14979	0.07695	0.19855	0.07562
0.1	0.00	0.15838	0.05121	0.15798	0.10214	0.15677	0.15254	0.15479	0.20213	0.15207
0.15	0.00	0.24008	0.05283	0.23944	0.10535	0.23755	0.15727	0.23446	0.20828	0.23021
0.2	0.00	0.32492	0.05522	0.32402	0.11008	0.32136	0.16422	0.31698	0.21732	0.31098
0.25	0.00	0.41421	0.05850	0.41300	0.11657	0.40940	0.17377	0.40350	0.22970	0.39543
0.3	0.00	0.50953	0.06289	0.50792	0.12522	0.50317	0.18647	0.49538	0.24613	0.48477
0.35	0.00	0.61280	0.06865	0.61070	0.13659	0.60446	0.20310	0.59427	0.26758	0.58044
0.4	0.00	0.72654	0.07623	0.72378	0.15149	0.71557	0.22484	0.70222	0.29549	0.68417
0.45	0.00	0.85408	0.08624	0.85040	0.17113	0.83951	0.25339	0.82186	0.33192	0.79813
0.5	0.00	1.0000	0.09967	0.99503	0.19738	0.98033	0.29131	0.95663	0.37995	0.92501
0.55	0.00	1.17085	0.11804	1.16395	0.23313	1.14365	0.34258	1.11113	0.44423	1.06819
0.6	0.00	1.37638	0.14392	1.36649	0.28315	1.33754	0.41357	1.29164	0.53203	1.23185
0.65	0.00	1.63185	0.18179	1.61702	0.35567	1.57401	0.51496	1.50674	0.65502	1.42088
0.7	0.00	1.96261	0.24007	1.93900	0.46575	1.87150	0.66202	1.75880	0.83268	1.64005
0.75	0.00	2.41421	0.33624	2.37365	0.64333	2.25941	0.90034	2.09061	1.09837	1.89083
0.8	0.00	3.07768	0.51109	2.99911	0.95397	2.78504	1.28858	2.48723	1.50982	2.16055
0.85	0.00	4.16530	0.87867	3.98246	1.56000	3.51765	1.97316	2.94167	2.16111	2.38860
0.9	0.00	6.31375	1.85674	5.72808	2.91746	4.47780	3.22989	3.27758	3.15925	2.37676
0.95	0.00	12.70620	5.79801	9.05499	6.21808	4.83133	5.28217	2.71349	4.39854	1.67517
1.0	0.00	∞	20.01667	0.00	10.03331	0.00	6.71659	0.00	5.06649	0.00
1.05	0.00	**12.70620**	5.79801	**9.05499**	6.21808	**4.83133**	5.28217	**2.71349**	4.39854	**1.67517**
1.1	0.00	**6.31375**	1.85674	**5.72808**	2.91746	**4.47780**	3.22989	**3.27758**	3.15925	**2.37676**
1.15	0.00	**4.16530**	0.87867	**3.98246**	1.56000	**3.51765**	1.97316	**2.94167**	2.16111	**2.38860**
1.2	0.00	**3.07768**	0.51109	**2.99911**	0.95397	**2.78504**	1.28858	**2.48723**	1.50982	**2.16055**
1.25	0.00	**2.41421**	0.33624	**2.37365**	0.64333	**2.25941**	0.90034	**2.09061**	1.09837	**1.89083**
1.3	0.00	**1.96261**	0.24007	**1.93900**	0.46575	**1.87150**	0.66202	**1.75880**	0.83268	**1.64005**
1.35	0.00	**1.63185**	0.18179	**1.61702**	0.35567	**1.57401**	0.51496	**1.50674**	0.65502	**1.42088**
1.4	0.00	**1.37638**	0.14392	**1.36649**	0.28315	**1.33754**	0.41357	**1.29164**	0.53203	**1.23185**
1.45	0.00	**1.17085**	0.11804	**1.16395**	0.23313	**1.14365**	0.34258	**1.11113**	0.44423	**1.06819**
1.5	0.00	**1.0000**	0.09967	**0.99503**	0.19738	**0.98033**	0.29131	**0.95663**	0.37995	**0.92501**
1.55	0.00	**0.85408**	0.08624	**0.85040**	0.17113	**0.83951**	0.25339	**0.82186**	0.33192	**0.79813**
1.6	0.00	**0.72654**	0.07623	**0.72378**	0.15149	**0.71557**	0.22484	**0.70222**	0.29549	**0.68417**
1.65	0.00	**0.61280**	0.06865	**0.61070**	0.13659	**0.60446**	0.20310	**0.59427**	0.26758	**0.58044**
1.7	0.00	**0.50953**	0.06289	**0.50792**	0.12522	**0.50317**	0.18647	**0.49538**	0.24613	**0.48477**
1.75	0.00	**0.41421**	0.05850	**0.41300**	0.11657	**0.40940**	0.17377	**0.40350**	0.22970	**0.39543**
1.8	0.00	**0.32492**	0.05522	**0.32402**	0.11008	**0.32136**	0.16422	**0.31698**	0.21732	**0.31098**
1.85	0.00	**0.24008**	0.05283	**0.23944**	0.10535	**0.23755**	0.15727	**0.23446**	0.20828	**0.23021**
1.9	0.00	**0.15838**	0.05121	**0.15798**	0.10214	**0.15677**	0.15254	**0.15479**	0.20213	**0.15207**
1.95	0.00	**0.07870**	0.05027	**0.07850**	0.10028	**0.07792**	0.14979	**0.07695**	0.19855	**0.07562**
2.0	0.00	0.00	0.04996	0.00	0.09967	0.00	0.14889	0.00	0.19738	0.00

Note. Negative quantities are in heavy type.

Examples. $\tanh (0 + i\,\underline{0.95}) = 0 + i\,12.70620.$
$\tanh (0 + i\,\underline{1.45}) = 0 - i\,1.17085.$

Table IX. HYPERBOLIC TANGENTS. $\tanh (x + iq) = u + iv$. Continued

q	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
0	0.24492	0.00	0.29131	0.00	0.33638	0.00	0.37995	0.00	0.42190	0.00
0.05	0.24635	0.07395	0.29296	0.07199	0.33322	0.06975	0.38196	0.06728	0.42405	0.06462
0.1	0.25069	0.14866	0.29799	0.14464	0.34384	0.14007	0.38808	0.13503	0.43056	0.12961
0.15	0.25814	0.22490	0.30660	0.21864	0.35346	0.21153	0.39853	0.20373	0.44169	0.19534
0.2	0.26907	0.30351	0.31921	0.29471	0.36750	0.28475	0.41376	0.27384	0.45784	0.26216
0.25	0.28402	0.38540	0.33640	0.37362	0.38658	0.36035	0.43438	0.34585	0.47964	0.33039
0.3	0.30377	0.47162	0.35903	0.45623	0.41161	0.43898	0.46130	0.42022	0.50796	0.40033
0.35	0.32947	0.56335	0.38833	0.54348	0.44383	0.52131	0.49575	0.49737	0.54397	0.47216
0.4	0.36272	0.66200	0.42600	0.63638	0.48497	0.60802	0.53941	0.57764	0.58924	0.54593
0.45	0.40582	0.76919	0.47444	0.73604	0.53739	0.69969	0.59450	0.66116	0.64580	0.62138
0.5	0.46212	0.88682	0.53705	0.84355	0.60437	0.79671	0.66404	0.74770	0.71630	0.69779
0.55	0.53655	1.01699	0.61869	0.95983	0.69041	0.89893	0.75200	0.83632	0.80407	0.77365
0.6	0.63656	1.16180	0.72640	1.08513	0.80176	1.00519	0.86357	0.92478	0.91321	0.84608
0.65	0.77356	1.32269	0.87037	1.21810	0.94684	1.11212	1.00528	1.00856	1.04844	0.91003
0.7	0.96528	1.49862	1.06521	1.35360	1.13666	1.21222	1.18469	1.07919	1.21438	0.95708
0.75	1.23914	1.68151	1.33091	1.47820	1.38412	1.29020	1.40896	1.12181	1.41397	0.97400
0.8	1.63553	1.84484	1.69121	1.56140	1.70028	1.31745	1.68068	1.11235	1.64487	0.94186
0.85	2.20223	1.91863	2.16210	1.54177	2.08309	1.24667	1.98936	1.01695	1.89366	0.83750
0.9	2.95122	1.75011	2.71602	1.31829	2.49443	1.01613	2.29855	0.79978	2.12957	0.64107
0.95	3.72316	1.11789	3.21905	0.79096	2.83603	0.58484	2.53928	0.44728	2.30471	0.35122
1.0	4.08299	**0.00**	3.43274	**0.00**	2.97287	**0.00**	2.63193	**0.00**	2.37024	**0.00**
1.05	3.72316	**1.11789**	3.21905	**0.79096**	2.83603	**0.58484**	2.53928	**0.44728**	2.30471	**0.35122**
1.1	2.95122	**1.75011**	2.71602	**1.31829**	2.49443	**1.01613**	2.29855	**0.79978**	2.12957	**0.64107**
1.15	2.20223	**1.91863**	2.16210	**1.54177**	2.08309	**1.24667**	1.98936	**1.01695**	1.89366	**0.83750**
1.2	1.63553	**1.84484**	1.69121	**1.56140**	1.70028	**1.31745**	1.68068	**1.11235**	1.64487	**0.94186**
1.25	1.23914	**1.68151**	1.33091	**1.47820**	1.38412	**1.29020**	1.40896	**1.12181**	1.41397	**0.97400**
1.3	0.96528	**1.49862**	1.06521	**1.35360**	1.13666	**1.21222**	1.18469	**1.07919**	1.21438	**0.95708**
1.35	0.77356	**1.32269**	0.87037	**1.21810**	0.94684	**1.11212**	1.00528	**1.00856**	1.04844	**0.91003**
1.4	0.63656	**1.16180**	0.72640	**1.08513**	0.80176	**1.00519**	0.86357	**0.92478**	0.91321	**0.84608**
1.45	0.53655	**1.01699**	0.61869	**0.95983**	0.69041	**0.89893**	0.75200	**0.83632**	0.80407	**0.77365**
1.5	0.46212	**0.88682**	0.53705	**0.84355**	0.60437	**0.79671**	0.66404	**0.74770**	0.71630	**0.69779**
1.55	0.40582	**0.76919**	0.47444	**0.73604**	0.53739	**0.69969**	0.59450	**0.66116**	0.64580	**0.62138**
1.6	0.36272	**0.66200**	0.42600	**0.63638**	0.48497	**0.60802**	0.53941	**0.57764**	0.58924	**0.54593**
1.65	0.32947	**0.56335**	0.38833	**0.54348**	0.44383	**0.52131**	0.49575	**0.49737**	0.54397	**0.47216**
1.7	0.30377	**0.47162**	0.35903	**0.45623**	0.41161	**0.43898**	0.46130	**0.42022**	0.50796	**0.40033**
1.75	0.28402	**0.38540**	0.33640	**0.37362**	0.38658	**0.36035**	0.43438	**0.34585**	0.47964	**0.33039**
1.8	0.26907	**0.30351**	0.31921	**0.29471**	0.36750	**0.28475**	0.41376	**0.27384**	0.45784	**0.26216**
1.85	0.25814	**0.22490**	0.30660	**0.21864**	0.35346	**0.21153**	0.39853	**0.20373**	0.44169	**0.19534**
1.9	0.25069	**0.14866**	0.29799	**0.14464**	0.34384	**0.14007**	0.38808	**0.13503**	0.43056	**0.12961**
1.95	0.24635	**0.07395**	0.29296	**0.07199**	0.33822	**0.06975**	0.38196	**0.06728**	0.42405	**0.06462**
2.0	0.24492	**0.00**	0.29131	**0.00**	0.33638	**0.00**	0.37995	**0.00**	0.42190	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh (0.4 + i\,\underline{0.4}) = 0.53941 + i\,0.57764$.
$\tanh (0.45 + i\,\underline{1.75}) = 0.47964 - i\,0.33039$.

q	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
0	0.46211	0.00	0.50052	0.00	0.53704	0.00	0.57167	0.00	0.60437	0.00
0.05	0.46436	0.06181	0.50284	0.05889	0.53941	0.05590	0.57405	0.05288	0.60674	0.04984
0.1	0.47119	0.12390	0.50987	0.11796	0.54657	0.11189	0.58125	0.10576	0.61390	0.09962
0.15	0.48281	0.18651	0.52183	0.17737	0.55872	0.16804	0.59344	0.15863	0.62602	0.14925
0.2	0.49964	0.24990	0.53910	0.23725	0.57620	0.22437	0.61094	0.21144	0.64336	0.19858
0.25	0.52227	0.31424	0.56223	0.29765	0.59953	0.28085	0.63419	0.26404	0.66631	0.24741
0.3	0.55151	0.37967	0.59196	0.35856	0.62935	0.33731	0.66377	0.31618	0.69534	0.29540
0.35	0.58846	0.44616	0.62928	0.41979	0.66653	0.39344	0.70039	0.36748	0.73105	0.34205
0.4	0.63452	0.51350	0.67541	0.48093	0.71212	0.44869	0.74493	0.41714	0.77413	0.38662
0.45	0.69149	0.58116	0.73188	0.54121	0.76736	0.50211	0.79836	0.46428	0.82533	0.42806
0.5	0.76159	0.64805	0.80050	0.59933	0.83365	0.55229	0.86173	0.50738	0.88535	0.46492
0.55	0.84752	0.71229	0.88332	0.65320	0.91249	0.59707	0.93607	0.54434	0.95480	0.49522
0.6	0.95230	0.77067	0.98247	0.69957	1.00521	0.63346	1.02195	0.57227	1.03389	0.51635
0.65	1.07907	0.81812	1.09973	0.73362	1.11262	0.65676	1.11962	0.58738	1.12222	0.52508
0.7	1.23020	0.84688	1.23587	0.74858	1.23436	0.66157	1.22793	0.58492	1.21827	0.51757
0.75	1.40579	0.84585	1.38926	0.73549	1.36782	0.64076	1.34386	0.55951	1.31896	0.48976
0.8	1.60095	0.80073	1.55398	0.68387	1.50695	0.58681	1.46173	0.50588	1.41909	0.43803
0.85	1.80225	0.69623	1.71785	0.58390	1.64135	0.49366	1.57271	0.42040	1.51148	0.36034
0.9	1.98505	0.52197	1.86183	0.43071	1.75601	0.35949	1.66532	0.30300	1.58713	0.25755
0.95	2.11599	0.28167	1.96180	0.22977	1.83417	0.19009	1.72736	0.15910	1.63711	0.13449
1.0	2.16395	**0.00**	1.99792	**0.00**	1.86202	**0.00**	1.74926	**0.00**	1.65462	**0.00**
1.05	2.11599	**0.28167**	1.96180	**0.22977**	1.83417	**0.19009**	1.72736	**0.15910**	1.63711	**0.13449**
1.1	1.98505	**0.52197**	1.86163	**0.43071**	1.75601	**0.35949**	1.66532	**0.30300**	1.58713	**0.25755**
1.15	1.80225	**0.69623**	1.71785	**0.58390**	1.64135	**0.49366**	1.57271	**0.42040**	1.51148	**0.36034**
1.2	1.60095	**0.80073**	1.55398	**0.68387**	1.50695	**0.58681**	1.46173	**0.50588**	1.41909	**0.43803**
1.25	1.40579	**0.84585**	1.38926	**0.73549**	1.36782	**0.64076**	1.34386	**0.55951**	1.31896	**0.48976**
1.3	1.23020	**0.84688**	1.23587	**0.74858**	1.23436	**0.66157**	1.22793	**0.58492**	1.21827	**0.51757**
1.35	1.07907	**0.81812**	1.09973	**0.73362**	1.11262	**0.65676**	1.11962	**0.58738**	1.12222	**0.52508**
1.4	0.95230	**0.77067**	0.98247	**0.69957**	1.00521	**0.63346**	1.02195	**0.57227**	1.03389	**0.51635**
1.45	0.84752	**0.71229**	0.88332	**0.65320**	0.91249	**0.59707**	0.93607	**0.54434**	0.95480	**0.49522**
1.5	0.76159	**0.64805**	0.80050	**0.59933**	0.83365	**0.55229**	0.86173	**0.50738**	0.88535	**0.46492**
1.55	0.69149	**0.58116**	0.73188	**0.54121**	0.76736	**0.50211**	0.79836	**0.46428**	0.82533	**0.42806**
1.6	0.63452	**0.51350**	0.67541	**0.48093**	0.71212	**0.44869**	0.74493	**0.41714**	0.77413	**0.38662**
1.65	0.58846	**0.44616**	0.62928	**0.41979**	0.66653	**0.39344**	0.70039	**0.36748**	0.73105	**0.34205**
1.7	0.55151	**0.37967**	0.59196	**0.35856**	0.62935	**0.33731**	0.66377	**0.31618**	0.69534	**0.29540**
1.75	0.52227	**0.31424**	0.56223	**0.29765**	0.59953	**0.28085**	0.63419	**0.26404**	0.66631	**0.25741**
1.8	0.49964	**0.24990**	0.53910	**0.23725**	0.57620	**0.22437**	0.61094	**0.21144**	0.64336	**0.19858**
1.85	0.48281	**0.18651**	0.52183	**0.17737**	0.55872	**0.16804**	0.59344	**0.15863**	0.62602	**0.14925**
1.9	0.47119	**0.12390**	0.50987	**0.11796**	0.54657	**0.11189**	0.58125	**0.10576**	0.61390	**0.09962**
1.95	0.46436	**0.06181**	0.50284	**0.05889**	0.53941	**0.05590**	0.57405	**0.05288**	0.60674	**0.04984**
2.0	0.46211	**0.00**	0.50052	**0.00**	0.53704	**0.00**	0.57167	**0.00**	0.60437	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(0.6 + i\,\underline{0.6}) = 1.00521 + i\,0.63346.$
$\tanh(0.6 + i\,\underline{1.5}) = 0.83365 - i\,0.55229.$

Table IX. HYPERBOLIC TANGENTS. $\tanh(x + iq) = u + iv$. Continued

q	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
0	0.63515	0.00	0.66403	0.00	0.69107	0.00	0.71629	0.00	0.73978	0.00
0.05	0.63749	0.04684	0.66633	0.04388	0.69330	0.04099	0.71845	0.03820	0.74185	0.03551
0.1	0.64456	0.09354	0.67325	0.08758	0.70002	0.08176	0.72494	0.07614	0.74807	0.07073
0.15	0.65649	0.13997	0.68490	0.13089	0.71132	0.12206	0.73582	0.11354	0.75850	0.10537
0.2	0.67352	0.18592	0.70148	0.17357	0.72736	0.16160	0.75123	0.15008	0.77321	0.13906
0.25	0.69595	0.23112	0.72325	0.21528	0.74832	0.20001	0.77130	0.18537	0.79231	0.17143
0.3	0.72420	0.27516	0.75051	0.25559	0.77446	0.23683	0.79620	0.21893	0.81592	0.20198
0.35	0.75872	0.31749	0.78364	0.29392	0.80603	0.27146	0.82611	0.25018	0.84411	0.23013
0.4	0.80005	0.35735	0.82300	0.32949	0.84328	0.30314	0.86117	0.27837	0.87695	0.25520
0.45	0.84871	0.39368	0.86893	0.36128	0.88638	0.33091	0.90143	0.30261	0.91438	0.27634
0.5	0.90515	0.42510	0.92167	0.38798	0.93541	0.35357	0.94681	0.32181	0.95624	0.29259
0.55	0.96963	0.44978	0.98122	0.40796	0.99018	0.36966	0.99700	0.33469	1.00211	0.30285
0.6	1.04203	0.46543	1.04722	0.41926	1.05015	0.37751	1.05136	0.33985	1.05129	0.30593
0.65	1.12161	0.46934	1.11872	0.42057	1.11427	0.37527	1.10885	0.33580	1.10271	0.30064
0.7	1.20665	0.45847	1.19395	0.40661	1.18081	0.36108	1.16765	0.32108	1.15485	0.28588
0.75	1.29416	0.42977	1.27012	0.37806	1.24723	0.33335	1.22572	0.29458	1.20569	0.26087
0.8	1.37961	0.38084	1.34331	0.33238	1.31017	0.29108	1.28006	0.25573	1.25279	0.22532
0.85	1.45701	0.31065	1.40862	0.26920	1.36562	0.23434	1.32742	0.20483	1.29344	0.17968
0.9	1.51945	0.22051	1.46062	0.19000	1.40931	0.16461	1.36438	0.14330	1.32493	0.12528
0.95	1.56023	0.11463	1.49428	0.09840	1.43735	0.08499	1.38796	0.07380	1.34490	0.06438
1.0	1.57443	**0.00**	1.50594	**0.00**	1.44703	**0.00**	1.39606	**0.00**	1.35175	**0.00**
1.05	1.56023	**0.11463**	1.49428	**0.09840**	1.43735	**0.08499**	1.38796	**0.07380**	1.34490	**0.06438**
1.1	1.51945	**0.22051**	1.46062	**0.19000**	1.40931	**0.16461**	1.36438	**0.14330**	1.32493	**0.12528**
1.15	1.45701	**0.31065**	1.40862	**0.26920**	1.36562	**0.23434**	1.32742	**0.20483**	1.29344	**0.17968**
1.2	1.37961	**0.38084**	1.34331	**0.33238**	1.31017	**0.29108**	1.28006	**0.25573**	1.25279	**0.22532**
1.25	1.29416	**0.42977**	1.27012	**0.37806**	1.24723	**0.33335**	1.22572	**0.29458**	1.20569	**0.26087**
1.3	1.20665	**0.45847**	1.19395	**0.40661**	1.18081	**0.36108**	1.16765	**0.32108**	1.15485	**0.28588**
1.35	1.12161	**0.46934**	1.11872	**0.42057**	1.11427	**0.37527**	1.10885	**0.33580**	1.10271	**0.30064**
1.4	1.04203	**0.46543**	1.04722	**0.41926**	1.05015	**0.37751**	1.05136	**0.33985**	1.05129	**0.30593**
1.45	0.96963	**0.44978**	0.98122	**0.40796**	0.99018	**0.36966**	0.99700	**0.33469**	1.00211	**0.30285**
1.5	0.90515	**0.42510**	0.92167	**0.38798**	0.93541	**0.35357**	0.94681	**0.32181**	0.95624	**0.29259**
1.55	0.84871	**0.39368**	0.86893	**0.36128**	0.88638	**0.33091**	0.90143	**0.30261**	0.91438	**0.27634**
1.6	0.80005	**0.35735**	0.82300	**0.32949**	0.84328	**0.30314**	0.86117	**0.27837**	0.87695	**0.25520**
1.65	0.75872	**0.31749**	0.78364	**0.29392**	0.80603	**0.27146**	0.82611	**0.25018**	0.84411	**0.23013**
1.7	0.72420	**0.27516**	0.75051	**0.25559**	0.77446	**0.23683**	0.79620	**0.21893**	0.81592	**0.20198**
1.75	0.69595	**0.23112**	0.72325	**0.21528**	0.74832	**0.20001**	0.77130	**0.18537**	0.79231	**0.17143**
1.8	0.67352	**0.18592**	0.70148	**0.17357**	0.72736	**0.16160**	0.75123	**0.15008**	0.77321	**0.13906**
1.85	0.65649	**0.13997**	0.68490	**0.13089**	0.71132	**0.12206**	0.73582	**0.11354**	0.75850	**0.10537**
1.9	0.64456	**0.09354**	0.67325	**0.08758**	0.70002	**0.08176**	0.72494	**0.07614**	0.74807	**0.07073**
1.95	0.63749	**0.04684**	0.66633	**0.04388**	0.69330	**0.04099**	0.71845	**0.03820**	0.74185	**0.03551**
2.0	0.63515	**0.00**	0.66403	**0.00**	0.69107	**0.00**	0.71629	**0.00**	0.73978	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(0.95 + i\,0) = 0.73978 + i\,0.$
$\tanh(0.9 + i\,\underline{1.9}) = 0.72494 - i\,0.07614.$

q	$x = 1.0$		$x = 1.05$		$x = 1.1$		$x = 1.15$		$x = 1.2$	
0	0.76159	0.00	0.78181	0.00	0.80050	0.00	0.81775	0.00	0.83365	0.00
0.05	0.76357	0.03293	0.78368	0.03048	0.80227	0.02816	0.81943	0.02597	0.83522	0.02390
0.1	0.76950	0.06556	0.78932	0.06065	0.80760	0.05599	0.82444	0.05160	0.83992	0.04748
0.15	0.77943	0.09757	0.79873	0.09016	0.81648	0.08317	0.83279	0.07658	0.84775	0.07041
0.2	0.79341	0.12858	0.81195	0.11867	0.82893	0.10932	0.84447	0.10054	0.85867	0.09233
0.25	0.81151	0.15821	0.82901	0.14575	0.84495	0.13405	0.85945	0.12310	0.87264	0.11288
0.3	0.83377	0.18598	0.84991	0.17096	0.86450	0.15692	0.87768	0.14383	0.88958	0.13166
0.35	0.86022	0.21133	0.87464	0.19377	0.88753	0.17742	0.89907	0.16226	0.90938	0.14823
0.4	0.89086	0.23361	0.90311	0.21356	0.91392	0.19501	0.92345	0.17789	0.93186	0.16213
0.45	0.92554	0.25205	0.93515	0.22966	0.94344	0.20906	0.95058	0.19017	0.95674	0.17287
0.5	0.96403	0.26580	0.97045	0.24130	0.97574	0.21892	0.98010	0.19852	0.98368	0.17996
0.55	1.00585	0.27392	1.00852	0.24767	1.01034	0.22389	1.01151	0.20236	1.01217	0.18288
0.6	1.05030	0.27542	1.04864	0.24798	1.04654	0.22331	1.04415	0.20115	1.04160	0.18123
0.65	1.09632	0.26933	1.08984	0.24144	1.08342	0.21658	1.07718	0.19441	1.07119	0.17461
0.7	1.14516	0.25486	1.13084	0.22747	1.11984	0.20326	1.10957	0.18182	1.10003	0.16281
0.75	1.18715	0.23145	1.17009	0.20572	1.15445	0.18315	1.14015	0.16330	1.12709	0.14580
0.8	1.22812	0.19904	1.20585	0.17623	1.18575	0.15637	1.16763	0.13902	1.15129	0.12380
0.85	1.26319	0.15812	1.23624	0.13955	1.21219	0.12347	1.19346	0.10950	1.17152	0.09730
0.9	1.29017	0.10993	1.25949	0.09677	1.23231	0.08544	1.20821	0.07563	1.18680	0.06709
0.95	1.30721	0.05638	1.27410	0.04956	1.24492	0.04369	1.21914	0.03863	1.19631	0.03424
1.0	1.31304	**0.00**	1.27908	**0.00**	1.24922	**0.00**	1.22286	**0.00**	1.19954	**0.00**
1.05	1.30721	**0.05638**	1.27410	**0.04956**	1.24492	**0.04369**	1.21914	**0.03863**	1.19631	**0.03424**
1.1	1.29017	**0.10993**	1.25949	**0.09677**	1.23231	**0.08544**	1.20821	**0.07563**	1.18680	**0.06709**
1.15	1.26319	**0.15812**	1.23624	**0.13955**	1.21219	**0.12347**	1.19346	**0.10950**	1.17152	**0.09730**
1.2	1.22812	**0.19904**	1.20585	**0.17623**	1.18575	**0.15637**	1.16763	**0.13902**	1.15129	**0.12380**
1.25	1.18715	**0.23145**	1.17009	**0.20572**	1.15445	**0.18315**	1.14015	**0.16330**	1.12709	**0.14580**
1.3	1.14516	**0.25486**	1.13084	**0.22747**	1.11984	**0.20326**	1.10957	**0.18182**	1.10003	**0.16281**
1.35	1.09632	**0.26933**	1.08984	**0.24144**	1.08342	**0.21658**	1.07718	**0.19441**	1.07119	**0.17461**
1.4	1.05030	**0.27542**	1.04864	**0.24798**	1.04654	**0.22331**	1.04415	**0.20115**	1.04160	**0.18123**
1.45	1.00585	**0.27392**	1.00852	**0.24767**	1.01034	**0.22389**	1.01151	**0.20236**	1.01217	**0.18288**
1.5	0.96403	**0.26580**	0.97045	**0.24130**	0.97574	**0.21892**	0.98010	**0.19852**	0.98368	**0.17996**
1.55	0.92554	**0.25205**	0.93515	**0.22966**	0.94344	**0.20906**	0.95058	**0.19017**	0.95674	**0.17287**
1.6	0.89086	**0.23361**	0.90311	**0.21356**	0.91392	**0.19501**	0.92345	**0.17789**	0.93186	**0.16213**
1.65	0.86022	**0.21133**	0.87464	**0.19377**	0.88753	**0.17742**	0.89907	**0.16226**	0.90938	**0.14823**
1.7	0.83377	**0.18598**	0.84991	**0.17096**	0.86450	**0.15692**	0.87768	**0.14383**	0.88958	**0.13166**
1.75	0.81151	**0.15821**	0.82901	**0.14575**	0.84495	**0.13405**	0.85945	**0.12310**	0.87264	**0.11288**
1.8	0.79341	**0.12858**	0.81195	**0.11867**	0.82893	**0.10932**	0.84447	**0.10054**	0.85867	**0.09233**
1.85	0.77943	**0.09757**	0.79873	**0.09016**	0.81648	**0.08317**	0.83279	**0.07658**	0.84775	**0.07041**
1.9	0.76950	**0.06556**	0.78932	**0.06065**	0.80760	**0.05599**	0.82444	**0.05160**	0.83992	**0.04748**
1.95	0.76357	**0.03293**	0.78368	**0.03048**	0.80227	**0.02816**	0.81943	**0.02597**	0.83522	**0.02390**
2.0	0.76159	**0.00**	0.78181	**0.00**	0.80050	**0.00**	0.81775	**0.00**	0.83365	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.2 + i\,\underline{0.75}) = 1.12709 + i\,0.14580.$
$\tanh(1.2 + i\,\underline{1.25}) = 1.12709 - i\,0.14580.$

q	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
0	0.84828	0.00	0.86172	0.00	0.87405	0.00	0.88535	0.00	0.89569	0.00
0.05	0.84975	0.02197	0.86309	0.02017	0.87533	0.01849	0.88653	0.01693	0.89678	0.01549
0.1	0.85414	0.04363	0.86719	0.04003	0.87913	0.03668	0.89006	0.03357	0.90005	0.03070
0.15	0.86145	0.06464	0.87398	0.05927	0.88544	0.05428	0.89591	0.04965	0.90545	0.04537
0.2	0.87162	0.08468	0.88344	0.07756	0.89421	0.07097	0.90401	0.06486	0.91293	0.05923
0.25	0.88461	0.10339	0.89548	0.09458	0.90535	0.08644	0.91429	0.07892	0.92240	0.07199
0.3	0.90032	0.12039	0.90791	0.10997	0.91875	0.10036	0.92663	0.09151	0.93375	0.08338
0.35	0.91861	0.13528	0.92686	0.12336	0.93425	0.11240	0.94087	0.10234	0.94680	0.09312
0.4	0.93928	0.14765	0.94585	0.13437	0.95166	0.12221	0.95680	0.11108	0.96137	0.10092
0.45	0.96207	0.15706	0.96669	0.14262	0.97069	0.12945	0.97417	0.11745	0.97719	0.10654
0.5	0.98661	0.16307	0.98903	0.14773	0.99101	0.13381	0.99263	0.12117	0.99396	0.10971
0.55	1.01244	0.16528	1.01243	0.14937	1.01219	0.13499	1.01181	0.12199	1.01133	0.11026
0.6	1.03897	0.16332	1.03634	0.14722	1.03375	0.13275	1.03125	0.11972	1.02885	0.10801
0.65	1.06550	0.15691	1.06013	0.14109	1.05510	0.12693	1.05042	0.11425	1.04607	0.10288
0.7	1.09121	0.14591	1.08308	0.13088	1.07560	0.11749	1.06875	0.10555	1.06248	0.09488
0.75	1.11521	0.13034	1.10439	0.11665	1.09457	0.10450	1.08565	0.09371	1.07756	0.08411
0.8	1.13656	0.11042	1.12328	0.09862	1.11131	0.08820	1.10052	0.07896	1.09078	0.07077
0.85	1.15434	0.08662	1.13895	0.07724	1.12512	0.06897	1.11277	0.06167	1.10166	0.05521
0.9	1.16772	0.05964	1.15070	0.05311	1.13551	0.04738	1.12192	0.04232	1.10976	0.03785
0.95	1.17603	0.03041	1.15799	0.02706	1.14192	0.02412	1.12758	0.02153	1.11476	0.01925
1.0	1.17885	**0.00**	1.16047	**0.00**	1.14410	**0.00**	1.12950	**0.00**	1.11646	**0.00**
1.05	1.17603	**0.03041**	1.15799	**0.02706**	1.14192	**0.02412**	1.12758	**0.02153**	1.11476	**0.01925**
1.1	1.16772	**0.05964**	1.15070	**0.05311**	1.13551	**0.04738**	1.12192	**0.04232**	1.10976	**0.03785**
1.15	1.15434	**0.08662**	1.13895	**0.07724**	1.12512	**0.06897**	1.11277	**0.06167**	1.10166	**0.05521**
1.2	1.13656	**0.11042**	1.12328	**0.09862**	1.11131	**0.08820**	1.10052	**0.07896**	1.09078	**0.07077**
1.25	1.11521	**0.13034**	1.10439	**0.11665**	1.09457	**0.10450**	1.08565	**0.09371**	1.07756	**0.08411**
1.3	1.09121	**0.14591**	1.08308	**0.13088**	1.07560	**0.11749**	1.06875	**0.10555**	1.06248	**0.09488**
1.35	1.06550	**0.15691**	1.06013	**0.14109**	1.05510	**0.12693**	1.05042	**0.11425**	1.04607	**0.10288**
1.4	1.03897	**0.16332**	1.03634	**0.14722**	1.03375	**0.13275**	1.03125	**0.11972**	1.02885	**0.10801**
1.45	1.01244	**0.16528**	1.01243	**0.14937**	1.01219	**0.13499**	1.01181	**0.12199**	1.01133	**0.11026**
1.5	0.98661	**0.16307**	0.98903	**0.14773**	0.99101	**0.13381**	0.99263	**0.12117**	0.99396	**0.10971**
1.55	0.96207	**0.15706**	0.96669	**0.14262**	0.97069	**0.12945**	0.97417	**0.17745**	0.97719	**0.10654**
1.6	0.93928	**0.14765**	0.94585	**0.13437**	0.95166	**0.12221**	0.95680	**0.11108**	0.96137	**0.10092**
1.65	0.91861	**0.13528**	0.92686	**0.12336**	0.93425	**0.11240**	0.94087	**0.10234**	0.94680	**0.09312**
1.7	0.90032	**0.12039**	0.90791	**0.10997**	0.91875	**0.10036**	0.92663	**0.09151**	0.93375	**0.08338**
1.75	0.88461	**0.10339**	0.89548	**0.09458**	0.90535	**0.08644**	0.91429	**0.07892**	0.92240	**0.07199**
1.8	0.87162	**0.08468**	0.88344	**0.07756**	0.89421	**0.07097**	0.90401	**0.06486**	0.91293	**0.05923**
1.85	0.86145	**0.06464**	0.87398	**0.05927**	0.88544	**0.05428**	0.89591	**0.04965**	0.90545	**0.04537**
1.9	0.85414	**0.04363**	0.86719	**0.04003**	0.87913	**0.03668**	0.89006	**0.03357**	0.90005	**0.03070**
1.95	0.84975	**0.02197**	0.86309	**0.02017**	0.87533	**0.01849**	0.88653	**0.01693**	0.89678	**0.01549**
2.0	0.84828	**0.00**	0.86172	**0.00**	0.87405	**0.00**	0.88535	**0.00**	0.89569	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.4 + i\,\underline{0.8}) = 1.10052 + i\,0.07896.$
$\tanh(1.3 + i\,\underline{1.3}) = 1.08308 - i\,0.13088.$

q	x = 1.5		x = 1.55		x = 1.6		x = 1.65		x = 1.7	
0	0.90515	0.00	0.91379	0.00	0.92167	0.00	0.92886	0.00	0.93541	0.00
0.05	0.90616	0.01415	0.91471	0.01292	0.92253	0.01178	0.92964	0.01074	0.93613	0.00979
0.1	0.90917	0.02804	0.91749	0.02560	0.92508	0.02334	0.93199	0.02127	0.93828	0.01937
0.15	0.91415	0.04143	0.92208	0.03779	0.92929	0.03445	0.93586	0.03138	0.94183	0.02857
0.2	0.92104	0.05404	0.92842	0.04927	0.93511	0.04488	0.94119	0.04086	0.94671	0.03718
0.25	0.92975	0.06563	0.93641	0.05978	0.94245	0.05442	0.94791	0.04951	0.95285	0.04502
0.3	0.94017	0.07593	0.94595	0.06909	0.95118	0.06284	0.95589	0.05712	0.96015	0.05190
0.35	0.95212	0.08468	0.95689	0.07697	0.96117	0.06993	0.96501	0.06351	0.96846	0.05766
0.4	0.96542	0.09165	0.96903	0.08320	0.97223	0.07551	0.97509	0.06850	0.97763	0.06213
0.45	0.97983	0.09660	0.98214	0.08758	0.98415	0.07938	0.98592	0.07193	0.98748	0.06517
0.5	0.99506	0.09933	0.99595	0.08992	0.99668	0.08139	0.99728	0.07367	0.99777	0.06667
0.55	1.01076	0.09965	1.01016	0.09008	1.00954	0.08142	1.00891	0.07361	1.00829	0.06655
0.6	1.02657	0.09746	1.02441	0.08796	1.02240	0.07940	1.02052	0.07169	1.01877	0.06474
0.65	1.04204	0.09268	1.03834	0.08353	1.03492	0.07530	1.03179	0.06791	1.02892	0.06126
0.7	1.05675	0.08534	1.05152	0.07680	1.04676	0.06915	1.04242	0.06230	1.03847	0.05614
0.75	1.07022	0.07554	1.06357	0.06790	1.05755	0.06107	1.05209	0.05495	1.04714	0.04948
0.8	1.08200	0.06349	1.07408	0.05700	1.06693	0.05121	1.06049	0.04604	1.05466	0.04142
0.85	1.09167	0.04947	1.08269	0.04438	1.07461	0.03984	1.06734	0.03579	1.06079	0.03218
0.9	1.09886	0.03390	1.08909	0.03038	1.08030	0.02726	1.07241	0.02448	1.06533	0.02200
0.95	1.10329	0.01723	1.09302	0.01544	1.08380	0.01385	1.07554	0.01243	1.06811	0.01117
1.0	1.10479	**0.00**	1.09436	**0.00**	1.08500	**0.00**	1.07659	**0.00**	1.06906	**0.00**
1.05	1.10329	**0.01723**	1.09302	**0.01544**	1.08380	**0.01385**	1.07554	**0.01243**	1.06811	**0.01117**
1.1	1.09886	**0.03390**	1.08909	**0.03038**	1.08030	**0.02726**	1.07241	**0.02448**	1.06533	**0.02200**
1.15	1.09167	**0.04947**	1.08269	**0.04438**	1.07461	**0.03984**	1.06734	**0.03579**	1.06079	**0.03218**
1.2	1.08200	**0.06349**	1.07408	**0.05700**	1.06693	**0.05121**	1.06049	**0.04604**	1.05466	**0.04142**
1.25	1.07022	**0.07554**	1.06357	**0.06790**	1.05755	**0.06107**	1.05209	**0.05495**	1.04714	**0.04948**
1.3	1.05675	**0.08534**	1.05152	**0.07680**	1.04676	**0.06915**	1.04242	**0.06230**	1.03847	**0.05614**
1.35	1.04204	**0.09268**	1.03834	**0.08353**	1.03492	**0.07530**	1.03179	**0.06791**	1.02892	**0.06126**
1.4	1.02657	**0.09746**	1.02441	**0.08796**	1.02240	**0.07940**	1.02052	**0.07169**	1.01877	**0.06474**
1.45	1.01076	**0.09965**	1.01016	**0.09008**	1.00954	**0.08142**	1.00891	**0.07361**	1.00829	**0.06655**
1.5	0.99506	**0.09933**	0.99595	**0.08992**	0.99668	**0.08139**	0.99728	**0.07367**	0.99777	**0.06667**
1.55	0.97983	**0.09660**	0.98214	**0.08758**	0.98415	**0.07938**	0.98592	**0.07193**	0.98748	**0.06517**
1.6	0.96542	**0.09165**	0.96903	**0.08320**	0.97223	**0.07551**	0.97509	**0.06850**	0.97763	**0.06213**
1.65	0.95212	**0.08468**	0.95689	**0.07697**	0.96117	**0.06993**	0.96501	**0.06351**	0.96846	**0.05766**
1.7	0.94017	**0.07593**	0.94595	**0.06909**	0.95118	**0.06284**	0.95589	**0.05712**	0.96015	**0.05190**
1.75	0.92975	**0.06563**	0.93641	**0.05978**	0.94245	**0.05442**	0.94791	**0.04951**	0.95285	**0.04502**
1.8	0.92104	**0.05404**	0.92842	**0.04927**	0.93511	**0.04488**	0.94119	**0.04086**	0.94671	**0.03718**
1.85	0.91415	**0.04143**	0.92208	**0.03779**	0.92929	**0.03445**	0.93586	**0.03138**	0.94183	**0.02857**
1.9	0.90917	**0.02804**	0.91749	**0.02560**	0.92508	**0.02334**	0.93199	**0.02127**	0.93828	**0.01937**
1.95	0.90616	**0.01415**	0.91471	**0.01292**	0.92253	**0.01178**	0.92964	**0.01074**	0.93613	**0.00979**
2.0	0.90515	**0.00**	0.91379	**0.00**	0.92167	**0.00**	0.92886	**0.00**	0.93541	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.7 + i\,\underline{0.7}) = 1.03847 + i\,0.05614$.
$\tanh(1.6 + i\,\underline{1.6}) = 0.97223 - i\,0.07551$.

q	$x = 1.75$		$x = 1.8$		$x = 1.85$		$x = 1.9$		$x = 1.95$	
0	0.94138	0.00	0.94681	0.00	0.95175	0.00	0.95624	0.00	0.96032	0.00
0.05	0.94204	0.00891	0.94741	0.00811	0.95230	0.00737	0.95674	0.00670	0.96078	0.00609
0.1	0.94400	0.01763	0.94921	0.01604	0.95394	0.01459	0.95825	0.01326	0.96215	0.01204
0.15	0.94725	0.02600	0.95218	0.02364	0.95666	0.02149	0.96072	0.01952	0.96441	0.01773
0.2	0.95172	0.03382	0.95626	0.03074	0.96038	0.02793	0.96412	0.02537	0.96750	0.02303
0.25	0.95733	0.04092	0.96139	0.03718	0.96506	0.03376	0.96838	0.03065	0.97138	0.02782
0.3	0.96399	0.04714	0.96746	0.04280	0.97059	0.03885	0.97342	0.03525	0.97597	0.03198
0.35	0.97156	0.05233	0.97435	0.04748	0.97686	0.04307	0.97912	0.03905	0.98116	0.03541
0.4	0.97991	0.05634	0.98194	0.05107	0.98376	0.04629	0.98538	0.04195	0.98684	0.03801
0.45	0.98884	0.05904	0.99005	0.05348	0.99111	0.04843	0.99206	0.04386	0.99289	0.03972
0.5	0.99818	0.06034	0.99851	0.05461	0.99878	0.04942	0.99900	0.04472	0.99918	0.04047
0.55	1.00769	0.06017	1.00711	0.05440	1.00656	0.04919	1.00604	0.04448	1.00555	0.04022
0.6	1.01714	0.05848	1.01565	0.05283	1.01427	0.04773	1.01300	0.04313	1.01184	0.03897
0.65	1.02629	0.05528	1.02389	0.04989	1.02170	0.04504	1.01970	0.04067	1.01788	0.03673
0.7	1.03488	0.05061	1.03162	0.04564	1.02866	0.04118	1.02596	0.03716	1.02352	0.03354
0.75	1.04266	0.04457	1.03861	0.04016	1.03494	0.03621	1.03162	0.03265	1.02862	0.02946
0.8	1.04940	0.03729	1.04466	0.03358	1.04037	0.03026	1.03650	0.02727	1.03300	0.02459
0.85	1.05489	0.02895	1.04958	0.02606	1.04478	0.02347	1.04046	0.02115	1.03656	0.01906
0.9	1.05895	0.01978	1.05320	0.01780	1.04804	0.01602	1.04337	0.01443	1.03918	0.01301
0.95	1.06143	0.01004	1.05543	0.00903	1.05003	0.00813	1.04516	0.00732	1.04078	0.00659
1.0	1.06228	**0.00**	1.05619	**0.00**	1.05070	**0.00**	1.04576	**0.00**	1.04131	**0.00**
1.05	1.06143	**0.01004**	1.05543	**0.00903**	1.05003	**0.00813**	1.04516	**0.00732**	1.04078	**0.00659**
1.1	1.05895	**0.01978**	1.05320	**0.01780**	1.04804	**0.01602**	1.04337	**0.01443**	1.03918	**0.01301**
1.15	1.05489	**0.02895**	1.04958	**0.02606**	1.04478	**0.02347**	1.04046	**0.02115**	1.03656	**0.01906**
1.2	1.04940	**0.03729**	1.04466	**0.03358**	1.04037	**0.03026**	1.03650	**0.02727**	1.03300	**0.02459**
1.25	1.04266	**0.04457**	1.03861	**0.04016**	1.03494	**0.03621**	1.03162	**0.03265**	1.02862	**0.02946**
1.3	1.03488	**0.05061**	1.03162	**0.04564**	1.02866	**0.04118**	1.02596	**0.03716**	1.02352	**0.03354**
1.35	1.02629	**0.05528**	1.02389	**0.04989**	1.02170	**0.04504**	1.01970	**0.04067**	1.01788	**0.03673**
1.4	1.01714	**0.05848**	1.01565	**0.05283**	1.01427	**0.04773**	1.01300	**0.04313**	1.01184	**0.03897**
1.45	1.00769	**0.06017**	1.00711	**0.05440**	1.00656	**0.04919**	1.00604	**0.04448**	1.00555	**0.04022**
1.5	0.99818	**0.06034**	0.99851	**0.05461**	0.99878	**0.04942**	0.99900	**0.04472**	0.99918	**0.04047**
1.55	0.98884	**0.05904**	0.99005	**0.05348**	0.99111	**0.04843**	0.99206	**0.04386**	0.99289	**0.03972**
1.6	0.97991	**0.05634**	0.98194	**0.05107**	0.98376	**0.04629**	0.98538	**0.04195**	0.98684	**0.03801**
1.65	0.97156	**0.05233**	0.97435	**0.04748**	0.97686	**0.04307**	0.97912	**0.03905**	0.98116	**0.03541**
1.7	0.96399	**0.04714**	0.96746	**0.04280**	0.97059	**0.03885**	0.97342	**0.03525**	0.97597	**0.03198**
1.75	0.95733	**0.04092**	0.96139	**0.03718**	0.96506	**0.03376**	0.96838	**0.03065**	0.97138	**0.02782**
1.8	0.95172	**0.03382**	0.95626	**0.03074**	0.96038	**0.02793**	0.96412	**0.02537**	0.96750	**0.02303**
1.85	0.94725	**0.02600**	0.95218	**0.02364**	0.95666	**0.02149**	0.96072	**0.01952**	0.96441	**0.01773**
1.9	0.94400	**0.01763**	0.94921	**0.01604**	0.95394	**0.01459**	0.95825	**0.01326**	0.96215	**0.01204**
1.95	0.94204	**0.00891**	0.94741	**0.00811**	0.95230	**0.00737**	0.95674	**0.00670**	0.96078	**0.00609**
2.0	0.94138	**0.00**	0.94681	**0.00**	0.95175	**0.00**	0.95624	**0.00**	0.96032	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.85 + i\,\underline{0.85}) = 1.04478 + i\,0.02347.$
$\tanh(1.95 + i\,\underline{1.25}) = 1.02862 - i\,0.02946.$

TABLE IX. HYPERBOLIC TANGENTS. $\tanh (x + iq) = u + iv$. CONTINUED

q	$x = 2.0$		$x = 2.05$		$x = 2.1$		$x = 2.15$		$x = 2.2$	
0	0.96403	0.00	0.96740	0.00	0.97045	0.00	0.97323	0.00	0.97574	0.00
0.05	0.96445	0.00553	0.96778	0.00502	0.97080	0.00456	0.97354	0.00413	0.97603	0.00375
0.1	0.96570	0.01094	0.96892	0.00993	0.97184	0.00901	0.97449	0.00817	0.97689	0.00741
0.15	0.96775	0.01610	0.97079	0.01461	0.97354	0.01326	0.97604	0.01203	0.97830	0.01091
0.2	0.97058	0.02090	0.97336	0.01897	0.97588	0.01721	0.97816	0.01561	0.98023	0.01415
0.25	0.97411	0.02524	0.97657	0.02289	0.97880	0.02076	0.98081	0.01882	0.98264	0.01706
0.3	0.97827	0.02900	0.98036	0.02630	0.98224	0.02384	0.98394	0.02161	0.98548	0.01958
0.35	0.98299	0.03209	0.98464	0.02909	0.98613	0.02636	0.98747	0.02388	0.98868	0.02163
0.4	0.98815	0.03444	0.98932	0.03120	0.99037	0.02826	0.99132	0.02559	0.99217	0.02317
0.45	0.99364	0.03596	0.99430	0.03256	0.99489	0.02948	0.99541	0.02669	0.99587	0.02416
0.5	0.99933	0.03662	0.99945	0.03314	0.99955	0.02998	0.99963	0.02713	0.99970	0.02455
0.55	1.00509	0.03638	1.00466	0.03290	1.00426	0.02976	1.00389	0.02691	1.00355	0.02434
0.6	1.01077	0.03523	1.00979	0.03184	1.00890	0.02878	1.00808	0.02602	1.00734	0.02353
0.65	1.01623	0.03318	1.01471	0.02998	1.01334	0.02709	1.01210	0.02448	1.01097	0.02212
0.7	1.02131	0.03028	1.01930	0.02734	1.01748	0.02469	1.01583	0.02231	1.01434	0.02015
0.75	1.02589	0.02658	1.02343	0.02399	1.02120	0.02166	1.01919	0.01956	1.01736	0.01767
0.8	1.02984	0.02218	1.02698	0.02001	1.02440	0.01806	1.02207	0.01631	1.01996	0.01472
0.85	1.03304	0.01719	1.02986	0.01550	1.02699	0.01399	1.02440	0.01262	1.02206	0.01140
0.9	1.03539	0.01172	1.03197	0.01057	1.02889	0.00954	1.02611	0.00861	1.02360	0.00777
0.95	1.03683	0.00594	1.03327	0.00536	1.03005	0.00483	1.02715	0.00436	1.02454	0.00394
1.0	1.03731	**0.00**	1.03370	**0.00**	1.03045	**0.00**	1.02751	**0.00**	1.02486	**0.00**
1.05	1.03683	**0.00594**	1.03327	**0.00536**	1.03005	**0.00483**	1.02715	**0.00436**	1.02454	**0.00394**
1.1	1.03539	**0.01172**	1.03197	**0.01057**	1.02889	**0.00954**	1.02611	**0.00861**	1.02360	**0.00777**
1.15	1.03304	**0.01719**	1.02986	**0.01550**	1.02699	**0.01399**	1.02440	**0.01262**	1.02206	**0.01140**
1.2	1.02984	**0.02218**	1.02698	**0.02001**	1.02440	**0.01806**	1.02207	**0.01631**	1.01996	**0.01472**
1.25	1.02589	**0.02658**	1.02343	**0.02399**	1.02120	**0.02166**	1.01919	**0.01956**	1.01736	**0.01767**
1.3	1.02131	**0.03028**	1.01930	**0.02734**	1.01748	**0.02469**	1.01583	**0.02231**	1.01434	**0.02015**
1.35	1.01623	**0.03318**	1.01471	**0.02998**	1.01334	**0.02709**	1.01210	**0.02448**	1.01097	**0.02212**
1.4	1.01077	**0.03523**	1.00979	**0.03184**	1.00890	**0.02878**	1.00808	**0.02602**	1.00734	**0.02353**
1.45	1.00509	**0.03638**	1.00466	**0.03290**	1.00426	**0.02976**	1.00389	**0.02691**	1.00355	**0.02434**
1.5	0.99933	**0.03662**	0.99945	**0.03314**	0.99955	**0.02998**	0.99963	**0.02713**	0.99970	**0.02455**
1.55	0.99364	**0.03596**	0.99430	**0.03256**	0.99489	**0.02948**	0.99541	**0.02669**	0.99587	**0.02416**
1.6	0.98815	**0.03444**	0.98932	**0.03120**	0.99037	**0.02826**	0.99132	**0.02559**	0.99217	**0.02317**
1.65	0.98299	**0.03209**	0.98464	**0.02909**	0.98613	**0.02636**	0.98747	**0.02388**	0.98868	**0.02163**
1.7	0.97827	**0.02900**	0.98036	**0.02630**	0.98224	**0.02384**	0.98394	**0.02161**	0.98548	**0.01958**
1.75	0.97411	**0.02524**	0.97657	**0.02289**	0.97880	**0.02076**	0.98081	**0.01882**	0.98264	**0.01706**
1.8	0.97058	**0.02090**	0.97336	**0.01897**	0.97588	**0.01721**	0.97816	**0.01561**	0.98023	**0.01415**
1.85	0.96775	**0.01610**	0.97079	**0.01461**	0.97354	**0.01326**	0.97604	**0.01203**	0.97830	**0.01091**
1.9	0.96570	**0.01094**	0.96892	**0.00993**	0.97184	**0.00901**	0.97449	**0.00817**	0.97689	**0.00741**
1.95	0.96445	**0.00553**	0.96778	**0.00502**	0.97080	**0.00456**	0.97354	**0.00413**	0.97603	**0.00375**
2.0	0.96403	**0.00**	0.96740	**0.00**	0.97045	**0.00**	0.97323	**0.00**	0.97574	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh (2.2 + i\,0) = 0.97574 + i\,0$.
$\tanh (2.15 + i\,\underline{1.15}) = 1.02440 - i\,0.01262$.

q	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
0	0.97803	0.00	0.98010	0.00	0.98197	0.00	0.98367	0.00	0.98522	0.00
0.05	0.97829	0.00340	0.98034	0.00308	0.98219	0.00280	0.98387	0.00253	0.98540	0.00230
0.1	0.97907	0.00672	0.98105	0.00610	0.98283	0.00553	0.98446	0.00501	0.98592	0.00454
0.15	0.98035	0.00989	0.98221	0.00897	0.98389	0.00813	0.98541	0.00736	0.98680	0.00667
0.2	0.98210	0.01283	0.98380	0.01163	0.98534	0.01054	0.98673	0.00955	0.98799	0.00865
0.25	0.98429	0.01547	0.98579	0.01401	0.98714	0.01270	0.98836	0.01150	0.98947	0.01042
0.3	0.98687	0.01774	0.98813	0.01607	0.98926	0.01456	0.99029	0.01319	0.99121	0.01194
0.35	0.98977	0.01960	0.99076	0.01775	0.99165	0.01607	0.99245	0.01456	0.99317	0.01318
0.4	0.99294	0.02098	0.99363	0.01900	0.99425	0.01720	0.99481	0.01557	0.99531	0.01410
0.45	0.99629	0.02187	0.99667	0.01979	0.99700	0.01791	0.99730	0.01621	0.99757	0.01468
0.5	0.99975	0.02222	0.99980	0.02010	0.99984	0.01819	0.99986	0.01646	0.99989	0.01489
0.55	1.00324	0.02202	1.00295	0.01992	1.00269	0.01802	1.00245	0.01630	1.00222	0.01474
0.6	1.00666	0.02127	1.00604	0.01924	1.00549	0.01740	1.00498	0.01573	1.00451	0.01423
0.65	1.00994	0.02000	1.00900	0.01808	1.00816	0.01634	1.00739	0.01478	1.00693	0.01336
0.7	1.01298	0.01821	1.01175	0.01646	1.01064	0.01487	1.00963	0.01345	1.00872	0.01216
0.75	1.01571	0.01596	1.01421	0.01442	1.01286	0.01303	1.01164	0.01178	1.01053	0.01064
0.8	1.01805	0.01330	1.01632	0.01201	1.01477	0.01085	1.01336	0.00981	1.01208	0.00886
0.85	1.01994	0.01029	1.01803	0.00929	1.01631	0.00839	1.01475	0.00758	1.01333	0.00685
0.9	1.02133	0.00701	1.01928	0.00633	1.01744	0.00572	1.01576	0.00517	1.01425	0.00467
0.95	1.02218	0.00355	1.02006	0.00322	1.01812	0.00290	1.01639	0.00262	1.01482	0.00237
1.0	1.02247	**0.00**	1.02031	**0.00**	1.01836	**0.00**	1.01659	**0.00**	1.01500	**0.00**
1.05	1.02218	**0.00355**	1.02006	**0.00322**	1.01812	**0.00290**	1.01639	**0.00262**	1.01482	**0.00237**
1.1	1.02133	**0.00701**	1.01928	**0.00633**	1.01744	**0.00572**	1.01576	**0.00517**	1.01425	**0.00467**
1.15	1.01994	**0.01029**	1.01803	**0.00929**	1.01631	**0.00839**	1.01475	**0.00758**	1.01333	**0.00685**
1.2	1.01805	**0.01330**	1.01632	**0.01201**	1.01477	**0.01085**	1.01336	**0.00981**	1.01208	**0.00886**
1.25	1.01571	**0.01596**	1.01421	**0.01442**	1.01286	**0.01303**	1.01164	**0.01178**	1.01053	**0.01064**
1.3	1.01298	**0.01821**	1.01175	**0.01646**	1.01064	**0.01487**	1.00963	**0.01345**	1.00872	**0.01216**
1.35	1.00994	**0.02000**	1.00900	**0.01808**	1.00816	**0.01634**	1.00739	**0.01478**	1.00693	**0.01336**
1.4	1.00666	**0.02127**	1.00604	**0.01924**	1.00549	**0.01740**	1.00498	**0.01573**	1.00451	**0.01423**
1.45	1.00324	**0.02202**	1.00295	**0.01992**	1.00269	**0.01802**	1.00245	**0.01630**	1.00222	**0.01474**
1.5	0.99975	**0.02222**	0.99980	**0.02010**	0.99984	**0.01819**	0.99986	**0.01646**	0.99989	**0.01489**
1.55	0.99629	**0.02187**	0.99667	**0.01979**	0.99700	**0.01791**	0.99730	**0.01621**	0.99757	**0.01468**
1.6	0.99294	**0.02098**	0.99363	**0.01900**	0.99425	**0.01720**	0.99481	**0.01557**	0.99531	**0.01410**
1.65	0.98977	**0.01960**	0.99076	**0.01775**	0.99165	**0.01607**	0.99245	**0.01456**	0.99317	**0.01318**
1.7	0.98687	**0.01774**	0.98813	**0.01607**	0.98926	**0.01456**	0.99029	**0.01319**	0.99121	**0.01194**
1.75	0.98429	**0.01547**	0.98579	**0.01401**	0.98714	**0.01270**	0.98836	**0.01150**	0.98947	**0.01042**
1.8	0.98210	**0.01283**	0.98380	**0.01163**	0.98534	**0.01054**	0.98673	**0.00955**	0.98799	**0.00865**
1.85	0.98035	**0.00989**	0.98221	**0.00897**	0.98389	**0.00813**	0.98541	**0.00736**	0.98680	**0.00667**
1.9	0.97907	**0.00672**	0.98105	**0.00610**	0.98283	**0.00553**	0.98446	**0.00501**	0.98592	**0.00454**
1.95	0.97829	**0.00340**	0.98034	**0.00308**	0.98219	**0.00280**	0.98387	**0.00253**	0.98540	**0.00230**
2.0	0.97803	**0.00**	0.98010	**0.00**	0.98197	**0.00**	0.98367	**0.00**	0.98522	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.25 + i\,\underline{0.25}) = 0.98429 + i\,0.01547.$
$\tanh(2.45 + i\,\underline{1.45}) = 1.00222 - i\,0.01474.$

q	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
0	0. 8661	0.00	0.98788	0.00	0.98903	0.00	0.99007	0.00	0.99101	0.00
0.05	0.98678	0.00208	0.98803	0.00189	0.98916	0.00171	0.99019	0.00155	0.99112	0.00140
0.1	0.98726	0.00411	0.98846	0.00373	0.98956	0.00337	0.99055	0.00306	0.99144	0.00277
0.15	0.98805	0.00605	0.98918	0.00548	0.99021	0.00496	0.99113	0.00449	0.99198	0.00407
0.2	0.98913	0.00784	0.99016	0.00710	0.99109	0.00643	0.99194	0.00582	0.99270	0.00527
0.25	0.99047	0.00944	0.99138	0.00855	0.99220	0.00774	0.99294	0.00701	0.99361	0.00635
0.3	0.99205	0.01082	0.99281	0.00979	0.99350	0.00887	0.99412	0.00803	0.99468	0.00727
0.35	0.99383	0.01193	0.99442	0.01080	0.99495	0.00978	0.99544	0.00886	0.99588	0.00802
0.4	0.99576	0.01276	0.99617	0.01155	0.99654	0.01046	0.99688	0.00947	0.99718	0.00857
0.45	0.99781	0.01328	0.99802	0.01202	0.99822	0.01088	0.99839	0.00985	0.99855	0.00891
0.5	0.99991	0.01348	0.99993	0.01219	0.99994	0.01103	0.99995	0.00998	0.99996	0.00903
0.55	1.00202	0.01334	1.00184	0.01207	1.00167	0.01092	1.00151	0.00988	1.00137	0.00893
0.6	1.00409	0.01287	1.00371	0.01164	1.00336	0.01053	1.00304	0.00952	1.00276	0.00862
0.65	1.00606	0.01208	1.00549	0.01093	1.00498	0.00988	1.00450	0.00894	1.00408	0.00808
0.7	1.00789	0.01099	1.00714	0.00994	1.00647	0.00898	1.00585	0.00812	1.00530	0.00735
0.75	1.00953	0.00962	1.00862	0.00870	1.00780	0.00786	1.00706	0.00711	1.00639	0.00643
0.8	1.01093	0.00801	1.00989	0.00726	1.00895	0.00654	1.00809	0.00592	1.00732	0.00535
0.85	1.01206	0.00619	1.01091	0.00560	1.00987	0.00506	1.00893	0.00457	1.00807	0.00413
0.9	1.01289	0.00422	1.01166	0.00381	1.01054	0.00345	1.00954	0.00312	1.00862	0.00282
0.95	1.01340	0.00214	1.01211	0.00193	1.01096	0.00175	1.00991	0.00158	1.00896	0.00143
1.0	1.01357	**0.00**	1.01227	**0.00**	1.01110	**0.00**	1.01003	**0.00**	1.00907	**0.00**
1.05	1.01340	**0.00214**	1.01211	**0.00193**	1.01096	**0.00175**	1.00991	**0.00158**	1.00896	**0.00143**
1.1	1.01289	**0.00422**	1.01166	**0.00381**	1.01054	**0.00345**	1.00954	**0.00312**	1.00862	**0.00282**
1.15	1.01206	**0.00619**	1.01091	**0.00560**	1.00987	**0.00506**	1.00893	**0.00457**	1.00807	**0.00413**
1.2	1.01093	**0.00801**	1.00989	**0.00726**	1.00895	**0.00654**	1.00809	**0.00592**	1.00732	**0.00535**
1.25	1.00953	**0.00962**	1.00862	**0.00870**	1.00780	**0.00786**	1.00706	**0.00711**	1.00639	**0.00643**
1.3	1.00789	**0.01099**	1.00714	**0.00994**	1.00647	**0.00898**	1.00585	**0.00812**	1.00530	**0.00735**
1.35	1.00606	**0.01208**	1.00549	**0.01093**	1.00498	**0.00988**	1.00450	**0.00894**	1.00408	**0.00808**
1.4	1.00409	**0.01287**	1.00371	**0.01164**	1.00336	**0.01053**	1.00304	**0.00952**	1.00276	**0.00862**
1.45	1.00202	**0.01334**	1.00184	**0.01207**	1.00167	**0.01092**	1.00151	**0.00988**	1.00137	**0.00893**
1.5	0.99991	**0.01348**	0.99993	**0.01219**	0.99994	**0.01103**	0.99995	**0.00998**	0.99996	**0.00903**
1.55	0.99781	**0.01328**	0.99802	**0.01202**	0.99822	**0.01088**	0.99839	**0.00985**	0.99855	**0.00891**
1.6	0.99576	**0.01276**	0.99617	**0.01155**	0.99654	**0.01046**	0.99688	**0.00947**	0.99718	**0.00857**
1.65	0.99383	**0.01193**	0.99442	**0.01080**	0.99495	**0.00978**	0.99544	**0.00886**	0.99588	**0.00802**
1.7	0.99205	**0.01082**	0.99281	**0.00979**	0.99350	**0.00887**	0.99412	**0.00803**	0.99468	**0.00727**
1.75	0.99047	**0.00944**	0.99138	**0.00855**	0.99220	**0.00774**	0.99294	**0.00701**	0.99361	**0.00635**
1.8	0.98913	**0.00784**	0.99016	**0.00710**	0.99109	**0.00643**	0.99194	**0.00582**	0.99270	**0.00527**
1.85	0.98805	**0.00605**	0.98918	**0.00548**	0.99021	**0.00496**	0.99113	**0.00449**	0.99198	**0.00407**
1.9	0.98726	**0.00411**	0.98846	**0.00373**	0.98956	**0.00337**	0.99055	**0.00306**	0.99144	**0.00277**
1.95	0.98678	**0.00208**	0.98803	**0.00189**	0.98916	**0.00171**	0.99019	**0.00155**	0.99112	**0.00140**
2.0	0.98661	**0.00**	0.98788	**0.00**	0.98903	**0.00**	0.99007	**0.00**	0.99101	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.60 + i\,\underline{0.35}) = 0.99495 + i\,0.00978$.
$\tanh(2.70 + i\,\underline{1.35}) = 1.00408 - i\,0.00808$.

q	$x = 2.75$		$x = 2.80$		$x = 2.85$		$x = 2.90$		$x = 2.95$	
0	0.99186	0.00	0.99263	0.00	0.99333	0.00	0.99396	0.00	0.99454	0.00
0.05	0.99196	0.00127	0.99272	0.00115	0.99341	0.00104	0.99404	0.00094	0.99460	0.00085
0.1	0.99225	0.00251	0.99299	0.00227	0.99365	0.00206	0.99426	0.00186	0.99480	0.00168
0.15	0.99274	0.00368	0.99343	0.00334	0.99405	0.00302	0.99462	0.00273	0.99513	0.00248
0.2	0.99340	0.00477	0.99403	0.00432	0.99459	0.00391	0.99511	0.00354	0.99557	0.00321
0.25	0.99422	0.00575	0.99477	0.00519	0.99527	0.00471	0.99572	0.00426	0.99613	0.00386
0.3	0.99519	0.00658	0.99564	0.00596	0.99606	0.00539	0.99644	0.00488	0.99678	0.00442
0.35	0.99627	0.00726	0.99663	0.00657	0.99695	0.00594	0.99724	0.00538	0.99750	0.00487
0.4	0.99745	0.00775	0.99769	0.00702	0.99791	0.00635	0.99811	0.00575	0.99830	0.00520
0.45	0.99869	0.00806	0.99882	0.00730	0.99893	0.00660	0.99904	0.00598	0.99913	0.00541
0.5	0.99997	0.00817	0.99997	0.00740	0.99998	0.00669	0.99998	0.00606	0.99999	0.00548
0.55	1.00125	0.00808	1.00113	0.00731	1.00103	0.00662	1.00093	0.00599	1.00084	0.00542
0.6	1.00250	0.00779	1.00226	0.00705	1.00205	0.00638	1.00186	0.00577	1.00168	0.00522
0.65	1.00369	0.00731	1.00334	0.00661	1.00303	0.00598	1.00274	0.00541	1.00248	0.00489
0.7	1.00479	0.00664	1.00434	0.00601	1.00393	0.00544	1.00355	0.00480	1.00322	0.00445
0.75	1.00578	0.00581	1.00523	0.00525	1.00473	0.00475	1.00428	0.00430	1.00387	0.00389
0.8	1.00662	0.00484	1.00599	0.00437	1.00542	0.00396	1.00490	0.00358	1.00444	0.00324
0.85	1.00730	0.00374	1.00661	0.00338	1.00598	0.00306	1.00540	0.00276	1.00489	0.00250
0.9	1.00780	0.00255	1.00706	0.00230	1.00638	0.00208	1.00577	0.00188	1.00522	0.00170
0.95	1.00810	0.00129	1.00733	0.00117	1.00663	0.00105	1.00600	0.00095	1.00542	0.00086
1.0	1.00821	**0.00**	1.00742	**0.00**	1.00671	**0.00**	1.00607	**0.00**	1.00549	**0.00**
1.05	1.00810	**0.00129**	1.00733	**0.00117**	1.00663	**0.00105**	1.00600	**0.00095**	1.00542	**0.00086**
1.1	1.00780	**0.00255**	1.00706	**0.00230**	1.00638	**0.00208**	1.00577	**0.00188**	1.00522	**0.00170**
1.15	1.00730	**0.00374**	1.00661	**0.00338**	1.00598	**0.00306**	1.00540	**0.00276**	1.00489	**0.00250**
1.2	1.00662	**0.00484**	1.00599	**0.00437**	1.00542	**0.00396**	1.00490	**0.00358**	1.00444	**0.00324**
1.25	1.00578	**0.00581**	1.00523	**0.00525**	1.00473	**0.00475**	1.00428	**0.00430**	1.00387	**0.00389**
1.3	1.00479	**0.00664**	1.00434	**0.00601**	1.00393	**0.00544**	1.00355	**0.00480**	1.00322	**0.00445**
1.35	1.00369	**0.00731**	1.00334	**0.00661**	1.00303	**0.00598**	1.00274	**0.00541**	1.00248	**0.00489**
1.4	1.00250	**0.00779**	1.00226	**0.00705**	1.00205	**0.00638**	1.00186	**0.00577**	1.00168	**0.00522**
1.45	1.00125	**0.00808**	1.00113	**0.00731**	1.00103	**0.00662**	1.00093	**0.00599**	1.00084	**0.00542**
1.5	0.99997	**0.00817**	0.99997	**0.00740**	0.99998	**0.00669**	0.99998	**0.00606**	0.99999	**0.00548**
1.55	0.99869	**0.00806**	0.99882	**0.00730**	0.99893	**0.00660**	0.99904	**0.00598**	0.99913	**0.00541**
1.6	0.99745	**0.00775**	0.99769	**0.00702**	0.99791	**0.00635**	0.99811	**0.00575**	0.99830	**0.00520**
1.65	0.99627	**0.00726**	0.99663	**0.00657**	0.99695	**0.00594**	0.99724	**0.00538**	0.99750	**0.00487**
1.7	0.99519	**0.00658**	0.99564	**0.00596**	0.99606	**0.00539**	0.99644	**0.00488**	0.99678	**0.00442**
1.75	0.99422	**0.00575**	0.99477	**0.00519**	0.99527	**0.00471**	0.99572	**0.00426**	0.99613	**0.00386**
1.8	0.99340	**0.00477**	0.99403	**0.00432**	0.99459	**0.00391**	0.99511	**0.00354**	0.99557	**0.00321**
1.85	0.99274	**0.00368**	0.99343	**0.00334**	0.99405	**0.00302**	0.99462	**0.00273**	0.99513	**0.00248**
1.9	0.99225	**0.00251**	0.99299	**0.00227**	0.99365	**0.00206**	0.99426	**0.00186**	0.99480	**0.00168**
1.95	0.99196	**0.00127**	0.99272	**0.00115**	0.99341	**0.00104**	0.99404	**0.00094**	0.99460	**0.00085**
2.0	0.99186	**0.00**	0.99263	**0.00**	0.99333	**0.00**	0.99396	**0.00**	0.99454	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.9 + i\,\underline{0.9}) = 1.00577 + i\,0.00188$.
$\tanh(2.95 + i\,\underline{1.95}) = 0.99460 - i\,0.00085$.

Table IX. HYPERBOLIC TANGENTS. $\tanh (x + iq) = u + iv$. Continued

q	$x = 3.0$		$x = 3.05$		$x = 3.10$		$x = 3.15$		$x = 3.20$	
0	0.99505	0.00	0.99552	0.00	0.99595	0.00	0.99633	0.00	0.99668	0.00
0.05	0.99512	0.00077	0.99558	0.00070	0.99600	0.00063	0.99638	0.00057	0.99672	0.00052
0.1	0.99530	0.00153	0.99574	0.00138	0.99615	0.00125	0.99651	0.00113	0.99684	0.00102
0.15	0.99559	0.00224	0.99601	0.00203	0.99639	0.00184	0.99673	0.00166	0.99704	0.00150
0.2	0.99599	0.00290	0.99637	0.00263	0.99672	0.00238	0.99703	0.00215	0.99731	0.00195
0.25	0.99649	0.00349	0.99683	0.00316	0.99713	0.00286	0.99740	0.00259	0.99765	0.00234
0.3	0.99708	0.00400	0.99736	0.00362	0.99761	0.00328	0.99784	0.00297	0.99805	0.00268
0.35	0.99774	0.00441	0.99796	0.00399	0.99815	0.00361	0.99833	0.00327	0.99849	0.00296
0.4	0.99846	0.00471	0.99861	0.00426	0.99874	0.00386	0.99886	0.00349	0.99897	0.00316
0.45	0.99921	0.00489	0.99929	0.00443	0.99936	0.00401	0.99942	0.00363	0.99947	0.00328
0.5	0.99999	0.00496	0.99999	0.00449	0.99999	0.00406	0.99999	0.00367	0.99999	0.00332
0.55	1.00076	0.00490	1.00069	0.00443	1.00063	0.00401	1.00057	0.00363	1.00051	0.00328
0.6	1.00152	0.00472	1.00138	0.00427	1.00125	0.00387	1.00113	0.00350	1.00102	0.00316
0.65	1.00224	0.00443	1.00203	0.00401	1.00184	0.00362	1.00166	0.00328	1.00151	0.00297
0.7	1.00291	0.00402	1.00263	0.00364	1.00238	0.00329	1.00216	0.00298	1.00195	0.00269
0.75	1.00351	0.00352	1.00317	0.00318	1.00287	0.00288	1.00260	0.00260	1.00235	0.00236
0.8	1.00401	0.00293	1.00363	0.00265	1.00329	0.00239	1.00297	0.00217	1.00269	0.00196
0.85	1.00443	0.00226	1.00400	0.00205	1.00362	0.00185	1.00328	0.00167	1.00297	0.00151
0.9	1.00473	0.00154	1.00426	0.00139	1.00387	0.00126	1.00350	0.00114	1.00317	0.00103
0.95	1.00491	0.00078	1.00444	0.00071	1.00402	0.00064	1.00363	0.00058	1.00329	0.00052
1.0	1.00497	**0.00**	1.00450	**0.00**	1.00407	**0.00**	1.00368	**0.00**	1.00333	**0.00**
1.05	1.00491	**0.00078**	1.00444	**0.00071**	1.00402	**0.00064**	1.00363	**0.00058**	1.00329	**0.00052**
1.1	1.00473	**0.00154**	1.00426	**0.00139**	1.00387	**0.00126**	1.00350	**0.00114**	1.00317	**0.00103**
1.15	1.00443	**0.00226**	1.00400	**0.00205**	1.00362	**0.00185**	1.00328	**0.00167**	1.00297	**0.00151**
1.2	1.00401	**0.00293**	1.00363	**0.00265**	1.00329	**0.00239**	1.00297	**0.00217**	1.00269	**0.00196**
1.25	1.00351	**0.00352**	1.00317	**0.00318**	1.00287	**0.00288**	1.00260	**0.00260**	1.00235	**0.00236**
1.3	1.00291	**0.00402**	1.00263	**0.00364**	1.00238	**0.00329**	1.00216	**0.00298**	1.00195	**0.00269**
1.35	1.00224	**0.00443**	1.00203	**0.00401**	1.00184	**0.00362**	1.00166	**0.00328**	1.00151	**0.00297**
1.4	1.00152	**0.00472**	1.00138	**0.00427**	1.00125	**0.00387**	1.00113	**0.00350**	1.00102	**0.00316**
1.45	1.00076	**0.00490**	1.00069	**0.00443**	1.00063	**0.00401**	1.00057	**0.00363**	1.00051	**0.00328**
1.5	0.99999	**0.00496**	0.99999	**0.00449**	0.99999	**0.00406**	0.99999	**0.00367**	0.99999	**0.00332**
1.55	0.99921	**0.00489**	0.99929	**0.00443**	0.99936	**0.00401**	0.99942	**0.00363**	0.99947	**0.00328**
1.6	0.99846	**0.00471**	0.99861	**0.00426**	0.99874	**0.00386**	0.99886	**0.00349**	0.99897	**0.00316**
1.65	0.99774	**0.00441**	0.99796	**0.00399**	0.99815	**0.00361**	0.99833	**0.00327**	0.99849	**0.00296**
1.7	0.99708	**0.00400**	0.99736	**0.00362**	0.99761	**0.00328**	0.99784	**0.00297**	0.99805	**0.00268**
1.75	0.99649	**0.00349**	0.99683	**0.00316**	0.99713	**0.00286**	0.99740	**0.00259**	0.99765	**0.00234**
1.8	0.99599	**0.00290**	0.99637	**0.00263**	0.99672	**0.00238**	0.99703	**0.00215**	0.99731	**0.00195**
1.85	0.99559	**0.00224**	0.99601	**0.00203**	0.99639	**0.00184**	0.99673	**0.00166**	0.99704	**0.00150**
1.9	0.99530	**0.00153**	0.99574	**0.00138**	0.99615	**0.00125**	0.99651	**0.00113**	0.99684	**0.00102**
1.95	0.99512	**0.00077**	0.99558	**0.00070**	0.99600	**0.00063**	0.99638	**0.00057**	0.99672	**0.00052**
2.0	0.99505	**0.00**	0.99552	**0.00**	0.99595	**0.00**	0.99633	**0.00**	0.99668	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh (3.0 + i\,\underline{1.00}) = 1.00497 + i\,0.$
$\tanh (3.0 + i\,\underline{1.50}) = 0.99999 - i\,0.00496.$

q	$x = 3.25$		$x = 3.30$		$x = 3.35$		$x = 3.40$		$x = 3.45$	
0	0.99700	0.00	0.99728	0.00	0.99754	0.00	0.99777	0.00	0.99799	0.00
0.05	0.99704	0.00047	0.99732	0.00042	0.99757	0.00038	0.99780	0.00035	0.99801	0.00031
0.1	0.99715	0.00093	0.99742	0.00084	0.99766	0.00076	0.99788	0.00069	0.99809	0.00062
0.15	0.99732	0.00136	0.99758	0.00123	0.99781	0.00112	0.99802	0.00101	0.99821	0.00091
0.2	0.99757	0.00176	0.99780	0.00160	0.99801	0.00144	0.99820	0.00131	0.99837	0.00118
0.25	0.99787	0.00212	0.99808	0.00192	0.99826	0.00174	0.99843	0.00157	0.99857	0.00142
0.3	0.98823	0.00243	0.99840	0.00220	0.99855	0.00199	0.99869	0.00180	0.99881	0.00163
0.35	0.99863	0.00268	0.99876	0.00242	0.99888	0.00219	0.99899	0.00198	0.99908	0.00179
0.4	0.99907	0.00286	0.99916	0.00259	0.99924	0.00234	0.99931	0.00212	0.99938	0.00192
0.45	0.99953	0.00297	0.99957	0.00269	0.99961	0.00243	0.99965	0.00220	0.99968	0.00200
0.5	1.00000	0.00301	1.00000	0.00272	1.00000	0.00246	1.00000	0.00223	1.00000	0.00202
0.55	1.00047	0.00297	1.00042	0.00269	1.00038	0.00243	1.00035	0.00220	1.00031	0.00200
0.6	1.00091	0.00286	1.00084	0.00259	1.00076	0.00234	1.00069	0.00212	1.00062	0.00192
0.65	1.00136	0.00268	1.00123	0.00243	1.00112	0.00220	1.00101	0.00199	1.00091	0.00180
0.7	1.00177	0.00244	1.00160	0.00220	1.00145	0.00199	1.00131	0.00180	1.00118	0.00163
0.75	1.00213	0.00213	1.00192	0.00193	1.00174	0.00174	1.00158	0.00158	1.00143	0.00143
0.8	1.00244	0.00177	1.00222	0.00160	1.00199	0.00145	1.00180	0.00131	1.00163	0.00119
0.85	1.00268	0.00137	1.00242	0.00124	1.00220	0.00112	1.00199	0.00103	1.00180	0.00092
0.9	1.00286	0.00093	1.00260	0.00084	1.00234	0.00076	1.00212	0.00069	1.00192	0.00062
0.95	1.00298	0.00047	1.00269	0.00043	1.00243	0.00039	1.00220	0.00035	1.00200	0.00032
1.0	1.00301	**0.00**	1.00273	**0.00**	1.00246	**0.00**	1.00223	**0.00**	1.00202	**0.00**
1.05	1.00298	**0.00047**	1.00269	**0.00043**	1.00243	**0.00039**	1.00220	**0.00035**	1.00200	**0.00032**
1.1	1.00286	**0.00093**	1.00260	**0.00084**	1.00234	**0.00076**	1.00212	**0.00069**	1.00192	**0.00062**
1.15	1.00268	**0.00137**	1.00242	**0.00124**	1.00220	**0.00112**	1.00199	**0.00103**	1.00180	**0.00092**
1.2	1.00244	**0.00177**	1.00222	**0.00160**	1.00199	**0.00145**	1.00180	**0.00131**	1.00163	**0.00119**
1.25	1.00213	**0.00213**	1.00192	**0.00193**	1.00174	**0.00174**	1.00158	**0.00158**	1.00143	**0.00143**
1.3	1.00177	**0.00244**	1.00160	**0.00220**	1.00145	**0.00199**	1.00131	**0.00180**	1.00118	**0.00163**
1.35	1.00136	**0.00268**	1.00123	**0.00243**	1.00112	**0.00220**	1.00101	**0.00199**	1.00091	**0.00180**
1.4	1.00091	**0.00286**	1.00084	**0.00259**	1.00076	**0.00234**	1.00069	**0.00212**	1.00062	**0.00192**
1.45	1.00047	**0.00297**	1.00042	**0.00269**	1.00038	**0.00243**	1.00035	**0.00220**	1.00031	**0.00200**
1.5	1.00000	**0.00301**	1.00000	**0.00272**	1.00000	**0.00246**	1.00000	**0.00223**	1.00000	**0.00202**
1.55	0.99953	**0.00297**	0.99957	**0.00269**	0.99961	**0.00243**	0.99965	**0.00220**	0.99968	**0.00200**
1.6	0.99907	**0.00286**	0.99916	**0.00259**	0.99924	**0.00234**	0.99931	**0.00212**	0.99938	**0.00192**
1.65	0.99863	**0.00268**	0.99876	**0.00242**	0.99888	**0.00219**	0.99899	**0.00198**	0.99908	**0.00179**
1.7	0.99823	**0.00243**	0.99840	**0.00220**	0.99855	**0.00199**	0.99869	**0.00180**	0.99881	**0.00163**
1.75	0.99787	**0.00212**	0.99808	**0.00192**	0.99826	**0.00174**	0.99843	**0.00157**	0.99857	**0.00142**
1.8	0.99757	**0.00176**	0.99780	**0.00160**	0.99801	**0.00144**	0.99820	**0.00131**	0.99837	**0.00118**
1.85	0.99732	**0.00136**	0.99758	**0.00123**	0.99781	**0.00112**	0.99802	**0.00101**	0.99821	**0.00091**
1.9	0.99715	**0.00093**	0.99742	**0.00084**	0.99766	**0.00076**	0.99788	**0.00069**	0.99809	**0.00062**
1.95	0.99704	**0.00047**	0.99732	**0.00042**	0.99757	**0.00038**	0.99780	**0.00035**	0.99801	**0.00031**
2.0	0.99700	**0.00**	0.99728	**0.00**	0.99754	**0.00**	0.99777	**0.00**	0.99799	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.25 + i\,\underline{0.75}) = 1.00213 + i\,0.00213.$
$\tanh(3.30 + i\,\underline{1.50}) = 1.00000 - i\,0.00272.$

Table IX HYPERBOLIC TANGENTS. $\tanh(x + iq) = u + iv$. Continued

q	$x = 3.50$		$x = 3.55$		$x = 3.60$		$x = 3.65$		$x = 3.70$	
0	0.99818	0.00	0.99835	0.00	0.99851	0.00	0.99865	0.00	0.99878	0.00
0.05	0.99820	0.00028	0.99837	0.00026	0.99853	0.00023	0.99867	0.00021	0.99879	0.00019
0.1	0.99827	0.00056	0.99843	0.00051	0.99858	0.00046	0.99872	0.00042	0.99884	0.00038
0.15	0.99837	0.00083	0.99853	0.00075	0.99867	0.00068	0.99880	0.00061	0.99891	0.00055
0.2	0.99853	0.00107	0.99867	0.00097	0.99879	0.00088	0.99891	0.00079	0.99901	0.00072
0.25	0.99871	0.00129	0.99883	0.00117	0.99894	0.00105	0.99904	0.00095	0.99914	0.00086
0.3	0.99893	0.00147	0.99903	0.00133	0.99912	0.00121	0.99921	0.00109	0.99928	0.00099
0.35	0.99917	0.00162	0.99925	0.00147	0.99932	0.00133	0.99939	0.00120	0.99944	0.00109
0.4	0.99944	0.00173	0.99949	0.00157	0.99954	0.00142	0.99958	0.00128	0.99962	0.00116
0.45	0.99971	0.00180	0.99974	0.00163	0.99977	0.00147	0.99979	0.00133	0.99981	0.00121
0.5	1.00000	0.00182	1.00000	0.00165	1.00000	0.00149	1.00000	0.00135	1.00000	0.00122
0.55	1.00028	0.00180	1.00026	0.00163	1.00025	0.00148	1.00021	0.00133	1.00019	0.00121
0.6	1.00056	0.00174	1.00051	0.00157	1.00048	0.00142	1.00042	0.00129	1.00038	0.00116
0.65	1.00083	0.00163	1.00075	0.00147	1.00068	0.00133	1.00061	0.00120	1.00055	0.00109
0.7	1.00107	0.00148	1.00097	0.00134	1.00088	0.00121	1.00079	0.00109	1.00072	0.00099
0.75	1.00129	0.00129	1.00117	0.00117	1.00106	0.00106	1.00096	0.00096	1.00086	0.00086
0.8	1.00148	0.00107	1.00133	0.00097	1.00121	0.00088	1.00108	0.00080	1.00099	0.00072
0.85	1.00163	0.00083	1.00147	0.00075	1.00133	0.00068	1.00120	0.00061	1.00109	0.00056
0.9	1.00174	0.00056	1.00157	0.00051	1.00142	0.00046	1.00129	0.00042	1.00116	0.00038
0.95	1.00180	0.00029	1.00163	0.00026	1.00148	0.00023	1.00134	0.00021	1.00121	0.00019
1.0	1.00183	**0.00**	1.00165	**0.00**	1.00149	**0.00**	1.00135	**0.00**	1.00122	**0.00**
1.05	1.00180	**0.00029**	1.00163	**0.00026**	1.00148	**0.00023**	1.00134	**0.00021**	1.00121	**0.00019**
1.1	1.00174	**0.00056**	1.00157	**0.00051**	1.00142	**0.00046**	1.00129	**0.00042**	1.00116	**0.00038**
1.15	1.00163	**0.00083**	1.00147	**0.00075**	1.00133	**0.00068**	1.00120	**0.00061**	1.00109	**0.00056**
1.2	1.00148	**0.00107**	1.00133	**0.00097**	1.00121	**0.00088**	1.00108	**0.00080**	1.00099	**0.00072**
1.25	1.00129	**0.00129**	1.00117	**0.00117**	1.00106	**0.00106**	1.00096	**0.00096**	1.00086	**0.00086**
1.3	1.00107	**0.00148**	1.00097	**0.00134**	1.00088	**0.00121**	1.00079	**0.00109**	1.00072	**0.00099**
1.35	1.00083	**0.00163**	1.00075	**0.00147**	1.00068	**0.00133**	1.00061	**0.00120**	1.00055	**0.00109**
1.4	1.00056	**0.00174**	1.00051	**0.00157**	1.00048	**0.00142**	1.00042	**0.00129**	1.00038	**0.00116**
1.45	1.00028	**0.00180**	1.00026	**0.00163**	1.00025	**0.00148**	1.00021	**0.00133**	1.00019	**0.00121**
1.5	1.00000	**0.00182**	1.00000	**0.00165**	1.00000	**0.00149**	1.00000	**0.00135**	1.00000	**0.00122**
1.55	0.99971	**0.00180**	0.99974	**0.00163**	0.99977	**0.00147**	0.99979	**0.00133**	0.99981	**0.00121**
1.6	0.99944	**0.00173**	0.99949	**0.00157**	0.99954	**0.00142**	0.99958	**0.00128**	0.99962	**0.00116**
1.65	0.99917	**0.00162**	0.99925	**0.00147**	0.99932	**0.00133**	0.99939	**0.00120**	0.99944	**0.00109**
1.7	0.99893	**0.00147**	0.99903	**0.00133**	0.99912	**0.00121**	0.99921	**0.00109**	0.99928	**0.00099**
1.75	0.99871	**0.00129**	0.99883	**0.00117**	0.99894	**0.00105**	0.99904	**0.00095**	0.99914	**0.00086**
1.8	0.99853	**0.00107**	0.99867	**0.00097**	0.99879	**0.00088**	0.99891	**0.00079**	0.99901	**0.00072**
1.85	0.99837	**0.00083**	0.99853	**0.00075**	0.99867	**0.00068**	0.99880	**0.00061**	0.99891	**0.00055**
1.9	0.99827	**0.00056**	0.99843	**0.00051**	0.99858	**0.00046**	0.99872	**0.00042**	0.99884	**0.00038**
1.95	0.99820	**0.00028**	0.99837	**0.00026**	0.99853	**0.00023**	0.99867	**0.00021**	0.99879	**0.00019**
2.0	0.99818	**0.00**	0.99835	**0.00**	0.99851	**0.00**	0.99865	**0.00**	0.99878	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.60 + i\,\underline{0.80}) = 1.00121 + i\,0.00088.$
$\tanh(3.70 + i\,\underline{1.70}) = 0.99928 - i\,0.00099.$

TABLE IX. HYPERBOLIC TANGENTS. tanh $(x + iq) = u + iv$. CONTINUED

q	$x = 3.75$		$x = 3.80$		$x = 3.85$		$x = 3.90$		$x = 3.95$	
0	0.99889	0.00	0.99900	0.00	0.99909	0.00	0.99918	0.00	0.99926	0.00
0.05	0.99891	0.00017	0.99901	0.00016	0.99911	0.00014	0.99919	0.00013	0.99927	0.00012
0.1	0.99895	0.00034	0.99905	0.00031	0.99914	0.00028	0.99922	0.00025	0.99930	0.00023
0.15	0.99901	0.00050	0.99911	0.00045	0.99919	0.00041	0.99927	0.00037	0.99934	0.00034
0.2	0.99911	0.00065	0.99919	0.00059	0.99927	0.00053	0.99934	0.00048	0.99940	0.00044
0.25	0.99922	0.00078	0.99929	0.00071	0.99936	0.00064	0.99942	0.00058	0.99948	0.00052
0.3	0.99935	0.00089	0.99941	0.00081	0.99947	0.00073	0.99952	0.00066	0.99956	0.00060
0.35	0.99950	0.00099	0.99955	0.00089	0.99959	0.00081	0.99963	0.00073	0.99966	0.00066
0.4	0.99966	0.00105	0.99969	0.00095	0.99972	0.00086	0.99975	0.00078	0.99977	0.00071
0.45	0.99983	0.00109	0.99984	0.00099	0.99986	0.00089	0.99987	0.00081	0.99988	0.00073
0.5	1.00000	0.00111	1.00000	0.00100	1.00000	0.00091	1.00000	0.00082	1.00000	0.00074
0.55	1.00017	0.00109	1.00016	0.00099	1.00014	0.00089	1.00013	0.00081	1.00012	0.00073
0.6	1.00034	0.00105	1.00031	0.00095	1.00028	0.00086	1.00025	0.00078	1.00023	0.00071
0.65	1.00050	0.00099	1.00045	0.00089	1.00041	0.00081	1.00037	0.00073	1.00034	0.00066
0.7	1.00065	0.00090	1.00059	0.00081	1.00053	0.00073	1.00048	0.00066	1.00044	0.00060
0.75	1.00078	0.00078	1.00071	0.00071	1.00064	0.00064	1.00058	0.00058	1.00052	0.00052
0.8	1.00089	0.00065	1.00081	0.00059	1.00073	0.00053	1.00066	0.00048	1.00060	0.00044
0.85	1.00099	0.00050	1.00089	0.00045	1.00081	0.00041	1.00073	0.00037	1.00066	0.00034
0.9	1.00105	0.00034	1.00096	0.00031	1.00086	0.00028	1.00078	0.00025	1.00071	0.00023
0.95	1.00109	0.00017	1.00099	0.00016	1.00089	0.00014	1.00081	0.00013	1.00073	0.00012
1.0	1.00111	**0.00**	1.00100	**0.00**	1.00090	**0.00**	1.00082	**0.00**	1.00074	**0.00**
1.05	1.00109	**0.00017**	1.00099	**0.00016**	1.00089	**0.00014**	1.00081	**0.00013**	1.00073	**0.00012**
1.1	1.00105	**0.00034**	1.00096	**0.00031**	1.00086	**0.00028**	1.00078	**0.00025**	1.00071	**0.00023**
1.15	1.00099	**0.00050**	1.00089	**0.00045**	1.00081	**0.00041**	1.00073	**0.00037**	1.00066	**0.00034**
1.2	1.00089	**0.00065**	1.00081	**0.00059**	1.00073	**0.00053**	1.00066	**0.00048**	1.00060	**0.00044**
1.25	1.00078	**0.00078**	1.00071	**0.00071**	1.00064	**0.00064**	1.00058	**0.00058**	1.00052	**0.00052**
1.3	1.00065	**0.00090**	1.00059	**0.00081**	1.00053	**0.00073**	1.00048	**0.00066**	1.00044	**0.00060**
1.35	1.00050	**0.00099**	1.00045	**0.00089**	1.00041	**0.00081**	1.00037	**0.00073**	1.00034	**0.00066**
1.4	1.00034	**0.00105**	1.00031	**0.00095**	1.00028	**0.00086**	1.00025	**0.00078**	1.00023	**0.00071**
1.45	1.00017	**0.00109**	1.00016	**0.00099**	1.00014	**0.00089**	1.00013	**0.00081**	1.00012	**0.00073**
1.5	1.00000	**0.00111**	1.00000	**0.00100**	1.00000	**0.00091**	1.00000	**0.00082**	1.00000	**0.00074**
1.55	0.99983	**0.00109**	0.99984	**0.00099**	0.99986	**0.00089**	0.99987	**0.00081**	0.99988	**0.00073**
1.6	0.99966	**0.00105**	0.99969	**0.00095**	0.99972	**0.00086**	0.99975	**0.00078**	0.99977	**0.00071**
1.65	0.99950	**0.00099**	0.99955	**00089**	0.99959	**0.00081**	0.99963	**0.00073**	0.99966	**0.00066**
1.7	0.99935	**0.00089**	0.99941	**0.00081**	0.99947	**0.00073**	0.99952	**0.00066**	0.99956	**0.00060**
1.75	0.99922	**0.00078**	0.99929	**0.00071**	0.99936	**0.00064**	0.99942	**0.00058**	0.99948	**0.00052**
1.8	0.99911	**0.00065**	0.99919	**0.00059**	0.99927	**0.00053**	0.99934	**0.00048**	0.99940	**0.00044**
1.85	0.99901	**0.00050**	0.99911	**0.00045**	0.99919	**0.00041**	0.99927	**0.00037**	0.99934	**0.00034**
1.9	0.99895	**0.00034**	0.99905	**0.00031**	0.99914	**0.00028**	0.99922	**0.00025**	0.99930	**0.00023**
1.95	0.99891	**0.00017**	0.99901	**0.00016**	0.99911	**0.00014**	0.99919	**0.00013**	0.99927	**0.00012**
2.0	0.99889	**0.00**	0.99900	**0.00**	0.99909	**0.00**	0.99918	**0.00**	0.99926	**0.00**

Note. Negative quantities are in heavy type.

Examples. tanh $(3.95 + i\,\underline{0.95}) = 1.00073 + i\,0.00012$.
tanh $(3.95 + i\,\underline{1.05}) = 1.00073 - i\,0.00012$.

TABLE X. HYPERBOLIC SINES. $\sinh (x + iq) = r \underline{/\gamma}$

	$x = 0.0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.000	90	0.05002	0.000	0.10017	0.000	0.15056	0.000	0.20134	0.000
0.05	0.07846	90	0.09305	57.593	0.12724	38.300	0.16978	27.861	0.21608	21.739
0.1	0.15643	90	0.16424	72.493	0.18576	57.819	0.21712	46.771	0.25497	38.746
0.15	0.23345	90	0.23874	78.245	0.25403	67.455	0.27779	58.195	0.30827	50.576
0.2	0.30902	90	0.31304	81.259	0.32485	72.947	0.34375	65.382	0.36882	58.723
0.25	0.38268	90	0.38594	83.123	0.39558	76.471	0.41124	70.229	0.43422	64.522
0.3	0.45399	90	0.45672	84.400	0.46491	78.932	0.47831	73.711	0.49663	68.825
0.35	0.52250	90	0.52487	85.339	0.53201	80.762	0.54376	76.344	0.55995	72.147
0.4	0.58778	90	0.58989	86.066	0.59626	82.189	0.60676	78.419	0.62131	74.802
0.45	0.64944	90	0.65135	86.652	0.65713	83.344	0.66667	80.111	0.67994	76.988
0.5	0.70711	90	0.70803	87.139	0.71417	84.308	0.72296	81.532	0.73521	78.835
0.55	0.76041	90	0.76202	87.557	0.76698	85.134	0.77527	82.753	0.78661	80.431
0.6	0.80902	90	0.81053	87.921	0.81520	85.858	0.82291	83.826	0.83370	81.839
0.65	0.85264	90	0.85407	88.246	0.85851	86.505	0.86583	84.787	0.87609	83.103
0.7	0.89101	90	0.89237	88.542	0.89662	87.093	0.90364	85.662	0.91347	84.257
0.75	0.92388	90	0.92523	88.814	0.92930	87.636	0.93607	86.471	0.94556	85.326
0.8	0.95106	90	0.95237	89.070	0.95632	88.145	0.96290	87.231	0.97213	86.331
0.85	0.97237	90	0.97366	89.313	0.97752	88.629	0.98396	87.953	0.99300	87.287
0.9	0.98769	90	0.98895	89.547	0.99275	89.095	0.99909	88.649	1.00800	88.209
0.95	0.99692	90	0.99817	89.775	1.00194	89.550	1.00822	89.329	1.01704	89.110
1.0	1.00000	90	1.00125	90.000	1.00500	90.000	1.01127	90.000	1.02007	90.000
1.05	0.99692	90	0.99817	90.225	1.00194	90.450	1.00822	90.671	1.01704	90.890
1.1	0.98769	90	0.98895	90.453	0.99275	90.905	0.99909	91.351	1.00800	91.791
1.15	0.97237	90	0.97366	90.687	0.97752	91.371	0.98396	92.047	0.99300	92.713
1.2	0.95106	90	0.95237	90.930	0.95632	91.855	0.96290	92.769	0.97213	93.669
1.25	0.92388	90	0.92523	91.186	0.92930	92.364	0.93607	93.529	0.94556	94.674
1.3	0.89101	90	0.89237	91.458	0.89662	92.907	0.90364	94.338	0.91347	95.743
1.35	0.85264	90	0.85407	91.754	0.85851	93.495	0.86583	95.213	0.87609	96.897
1.4	0.80902	90	0.81053	92.079	0.81520	94.142	0.82291	96.174	0.83370	98.161
1.45	0.76041	90	0.76202	92.443	0.76698	94.866	0.77527	97.247	0.78661	99.569
1.5	0.70711	90	0.70803	92.860	0.71417	95.692	0.72296	98.468	0.73521	101.165
1.55	0.64944	90	0.65135	93.348	0.65713	96.656	0.66667	99.889	0.67994	103.012
1.6	0.58778	90	0.58989	93.934	0.59626	97.811	0.60676	101.581	0.62131	105.198
1.65	0.52250	90	0.52487	94.661	0.53201	99.238	0.54376	103.656	0.55995	107.853
1.7	0.45399	90	0.45672	95.600	0.46491	101.068	0.47831	106.289	0.49663	111.175
1.75	0.38268	90	0.38594	96.877	0.39558	103.529	0.41124	109.771	0.43242	115.478
1.8	0.30902	90	0.31304	98.741	0.32485	107.053	0.34375	114.618	0.36882	121.277
1.85	0.23345	90	0.23874	101.755	0.25403	112.545	0.27779	121.805	0.30827	129.424
1.9	0.15643	90	0.16424	107.507	0.18576	122.181	0.21712	133.229	0.25497	141.254
1.95	0.07846	90	0.09305	122.407	0.12724	141.700	0.16978	152.139	0.21608	158.261
2.0	0.00	90	0.05002	180.000	0.10017	180.000	0.15056	180.000	0.20134	180.000

Example. $\sinh (0.15 + i\, \underline{0.15}) = 0.27779 \underline{/58^\circ.195} = 0.27779 \underline{/58^\circ.11'.42''}.$

Table X. HYPERBOLIC SINES. $\sinh(x + iq) = r \angle \gamma$. Continued

	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.25261	0.000	0.30452	0.000	0.35719	0.000	0.41075	0.000	0.46534	0.000
0.05	0.26452	17.814	0.31447	15.118	0.36571	13.169	0.41818	11.703	0.47191	10.567
0.1	0.29782	32.890	0.34235	28.533	0.38994	25.214	0.43953	22.629	0.49093	20.576
0.15	0.34396	44.943	0.38370	39.493	0.42671	35.516	0.47246	32.288	0.52062	29.642
0.2	0.39913	52.992	0.43385	48.122	0.47231	44.008	0.51401	40.536	0.55860	37.601
0.25	0.45854	59.405	0.48906	54.882	0.52348	50.921	0.56140	47.471	0.60249	44.473
0.3	0.51954	64.327	0.54666	60.242	0.57766	56.843	0.61223	53.288	0.65012	50.374
0.35	0.58036	68.215	0.60476	64.575	0.63292	61.237	0.66462	58.200	0.69968	55.454
0.4	0.63977	71.371	0.66199	68.151	0.68781	65.157	0.71708	62.393	0.74969	59.856
0.45	0.69685	73.999	0.71730	71.166	0.74119	68.503	0.76844	66.018	0.79895	63.712
0.5	0.75088	76.238	0.76989	73.759	0.79220	71.408	0.81775	69.196	0.84649	67.125
0.55	0.80127	78.185	0.81912	76.028	0.84012	73.971	0.86426	72.021	0.89149	70.184
0.6	0.84754	79.911	0.86443	78.049	0.88436	76.267	0.90732	74.568	0.93330	72.958
0.65	0.88927	81.464	0.90539	79.878	0.92444	78.353	0.94642	76.893	0.97136	75.504
0.7	0.92612	82.887	0.94161	81.557	0.95994	80.274	0.98113	79.043	1.00521	77.868
0.75	0.95779	84.207	0.97277	83.119	0.99052	82.068	1.01107	81.056	1.03446	80.087
0.8	0.98403	85.450	0.99862	84.593	1.01592	83.762	1.03597	82.962	1.05880	82.194
0.85	1.00464	86.635	1.01894	85.999	1.03590	85.383	1.05557	84.788	1.07798	84.216
0.9	1.01949	87.779	1.03357	87.358	1.05029	86.951	1.06970	86.556	1.09182	86.177
0.95	1.02843	88.896	1.04239	88.687	1.05898	88.484	1.07822	88.287	1.10017	88.098
1.0	1.03141	90.000	1.04534	90.000	1.06188	90.000	1.08107	90.000	1.10297	90.000
1.05	1.02843	91.104	1.04239	91.313	1.05898	91.516	1.07822	91.713	1.10017	91.902
1.1	1.01949	92.221	1.03357	92.642	1.05029	93.050	1.06970	93.444	1.09182	93.823
1.15	1.00464	93.365	1.01894	94.001	1.03590	94.617	1.05557	95.212	1.07798	95.784
1.2	0.98403	94.550	0.99862	95.407	1.01592	96.238	1.03597	97.038	1.05880	97.806
1.25	0.95779	95.793	0.97277	96.881	0.99052	97.932	1.01107	98.944	1.03446	99.913
1.3	0.92612	97.113	0.94161	98.443	0.95994	99.726	0.98113	100.957	1.00521	102.132
1.35	0.88927	98.536	0.90539	100.122	0.92444	101.647	0.94642	103.107	0.97136	104.496
1.4	0.84754	100.090	0.86443	101.951	0.88436	103.733	0.90732	105.432	0.93330	107.042
1.45	0.80127	101.815	0.81912	103.972	0.84012	106.029	0.86426	107.979	0.89149	109.816
1.5	0.75088	103.762	0.76989	106.241	0.79220	108.592	0.81775	110.804	0.84649	112.875
1.55	0.69685	106.001	0.71730	108.834	0.74119	111.497	0.76844	113.982	0.79895	116.288
1.6	0.63977	108.629	0.66199	111.849	0.68781	114.843	0.71708	117.607	0.74969	120.144
1.65	0.58036	111.785	0.60476	115.425	0.63292	118.763	0.66462	121.800	0.69968	124.546
1.7	0.51954	115.673	0.54666	119.758	0.57766	123.157	0.61223	126.712	0.65012	129.626
1.75	0.45854	120.595	0.48906	125.118	0.52348	129.079	0.56140	132.529	0.60249	135.527
1.8	0.39913	127.008	0.43385	131.878	0.47231	135.992	0.51401	139.464	0.55860	142.399
1.85	0.34396	135.057	0.38370	140.507	0.42671	144.484	0.47246	147.712	0.52062	150.358
1.9	0.29782	147.110	0.34235	151.467	0.38994	154.786	0.43953	157.371	0.49093	159.424
1.95	0.26452	162.186	0.31447	164.882	0.36571	166.831	0.41818	168.297	0.47191	169.433
2.0	0.25261	180.000	0.30452	180.000	0.35719	180.000	0.41075	180.000	0.46534	180.000

Example. $\sinh(0.40 + i\,\underline{0.25}) = 0.56140 \angle 47°.471 = 0.56140 \angle 47°.28'.16''$.

	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.52110	0.000	0.57815	0.000	0.63665	0.000	0.69675	0.000	0.75858	0.000
0.05	0.52697	9.665	0.58345	8.936	0.64147	8.337	0.70115	7.839	0.76263	7.419
0.1	0.54407	18.918	0.59894	17.559	0.65559	16.432	0.71409	15.486	0.77455	14.685
0.15	0.57100	27.453	0.62350	25.625	0.67810	24.086	0.73482	22.781	0.79369	21.665
0.2	0.60583	35.111	0.65555	32.990	0.70769	31.174	0.76220	29.613	0.81911	28.263
0.25	0.64652	41.871	0.69333	39.610	0.74282	37.642	0.79492	35.926	0.84965	34.426
0.3	0.69112	47.793	0.73510	45.511	0.78194	43.494	0.83160	41.710	0.88406	40.133
0.35	0.73793	52.980	0.77927	50.759	0.82361	48.769	0.87090	46.989	0.92112	45.397
0.4	0.78552	57.542	0.82447	55.437	0.86650	53.529	0.91156	51.803	0.95966	50.245
0.45	0.83266	61.584	0.86951	59.628	0.90946	57.838	0.95249	56.204	0.99861	54.716
0.5	0.87837	65.198	0.91338	63.411	0.95149	61.762	0.99270	60.245	1.03704	58.853
0.55	0.92182	68.462	0.95524	66.854	0.99171	65.360	1.03134	63.976	1.07409	62.698
0.6	0.96232	71.441	0.99437	70.016	1.02948	68.685	1.06769	67.445	1.10904	66.294
0.65	0.99927	74.189	1.03004	72.948	1.06411	71.784	1.10111	70.694	1.14125	69.677
0.7	1.03220	76.751	1.06214	75.693	1.09509	74.696	1.13108	73.760	1.17019	72.884
0.75	1.06070	79.164	1.08987	78.287	1.12200	77.459	1.15715	76.678	1.19541	75.946
0.8	1.08446	81.461	1.11300	80.763	1.14448	80.102	1.17892	79.477	1.21653	78.890
0.85	1.10320	83.669	1.13127	83.148	1.16226	82.653	1.19623	82.185	1.23327	81.744
0.9	1.11672	85.814	1.14446	85.467	1.17510	85.121	1.20871	84.826	1.24538	84.532
0.95	1.12489	87.917	1.15244	87.744	1.18287	87.580	1.21626	87.424	1.25271	87.277
1.0	1.12763	90.000	1.15510	90.000	1.18547	90.000	1.21879	90.000	1.25517	90.000
1.05	1.12489	92.083	1.15244	92.256	1.18287	92.420	1.21626	92.576	1.25271	92.723
1.1	1.11672	94.186	1.14446	94.533	1.17510	94.879	1.20871	95.174	1.24538	95.468
1.15	1.10320	96.331	1.13127	96.852	1.16226	97.347	1.19623	97.815	1.23327	98.256
1.2	1.08446	98.539	1.11300	99.237	1.14448	99.898	1.17892	100.523	1.21653	101.110
1.25	1.06070	100.836	1.08987	101.713	1.12200	102.541	1.15715	103.322	1.19541	104.054
1.3	1.03220	103.249	1.06214	104.307	1.09509	105.304	1.13108	106.240	1.17019	107.116
1.35	0.99927	105.811	1.03004	107.052	1.06411	108.216	1.10111	109.306	1.14125	110.323
1.4	0.96232	108.559	0.99437	109.984	1.02948	111.315	1.06769	112.555	1.10904	113.706
1.45	0.92182	111.538	0.95524	113.146	0.99174	114.640	1.03134	116.024	1.07409	117.302
1.5	0.87837	114.803	0.91338	116.589	0.95149	118.238	0.99270	119.755	1.03704	121.148
1.55	0.83266	118.416	0.86951	120.372	0.90946	122.162	0.95249	123.796	0.99861	125.284
1.6	0.78552	122.458	0.82447	124.563	0.86650	126.471	0.91156	128.197	0.95966	129.755
1.65	0.73793	127.020	0.77927	129.241	0.82361	131.231	0.87090	133.011	0.92112	134.603
1.7	0.69112	132.207	0.73510	134.489	0.78194	136.506	0.83160	138.290	0.88406	139.867
1.75	0.64652	138.129	0.69333	140.390	0.74282	142.358	0.79492	144.074	0.84965	145.574
1.8	0.60583	144.889	0.65555	147.010	0.70769	148.826	0.76220	150.387	0.81911	151.737
1.85	0.57100	152.547	0.62350	154.375	0.67810	155.914	0.73482	157.219	0.79369	158.335
1.9	0.54407	161.082	0.59894	162.441	0.65559	163.568	0.71409	164.514	0.77455	165.315
1.95	0.52697	170.335	0.58345	171.064	0.64147	171.663	0.70115	172.161	0.76263	172.581
2.0	0.52110	180.000	0.57815	180.000	0.63665	180.000	0.69675	180.000	0.75858	180.000

Example. sinh $(0.70 + i\,\underline{1.70}) = 0.88406\,\underline{/139°.867} = 0.88406\,\underline{/130°.52'.01''}$.

TABLE X. HYPERBOLIC SINES. $\sinh(x+iq) = r \angle \gamma$. CONTINUED

	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0.00	0.82232	0.000	0.88811	0.000	0.95612	0.000	1.02652	0.000	1.09948	0.000
0.05	0.82605	7.064	0.89157	6.759	0.95933	6.497	1.02951	6.270	1.10227	6.073
0.10	0.83706	14.002	0.90178	13.415	0.96883	12.909	1.03837	12.468	1.11056	12.085
0.15	0.85481	20.706	0.91828	19.877	0.98420	19.158	1.05273	18.529	1.12400	17.980
0.2	0.87846	27.093	0.94033	26.073	1.00481	25.181	1.07202	24.399	1.14209	23.712
0.25	0.90700	33.111	0.96705	31.955	1.02985	30.938	1.09553	30.039	1.16418	29.245
0.3	0.93932	38.737	0.99742	37.500	1.05843	36.401	1.12243	35.426	1.19227	34.557
0.35	0.97427	43.974	1.03041	42.702	1.08957	41.565	1.15184	40.547	1.21732	39.637
0.4	1.01079	48.840	1.06500	47.574	1.12234	46.433	1.18289	45.407	1.24674	44.483
0.45	1.04785	53.363	1.10024	52.135	1.15583	51.022	1.21471	50.014	1.27697	49.102
0.5	1.08453	57.578	1.13522	56.414	1.18918	55.353	1.24649	54.386	1.30723	53.507
0.55	1.12001	61.522	1.16917	60.441	1.22163	59.450	1.27748	58.543	1.33682	57.714
0.6	1.15356	65.228	1.20135	64.245	1.25246	63.399	1.30700	62.507	1.36505	61.743
0.65	1.18457	68.733	1.23115	67.857	1.28107	67.048	1.33444	66.301	1.39136	65.613
0.7	1.21248	72.067	1.25802	71.307	1.30693	70.602	1.35927	69.949	1.41519	69.347
0.75	1.23689	75.260	1.28152	74.621	1.32955	74.026	1.38105	73.474	1.43611	72.963
0.8	1.25726	78.339	1.30124	77.825	1.34858	77.344	1.39937	76.898	1.45371	76.484
0.85	1.27346	81.330	1.31691	80.942	1.36369	80.580	1.41395	80.242	1.46778	79.929
0.9	1.28520	84.255	1.32825	83.996	1.37466	83.754	1.42452	83.527	1.47797	83.316
0.95	1.29230	87.138	1.33513	87.008	1.38130	86.887	1.43094	86.773	1.48415	86.668
1.0	1.29468	90.000	1.33743	90.000	1.38353	90.000	1.43309	90.000	1.48623	90.000
1.05	1.29230	92.862	1.33513	92.992	1.38130	93.113	1.43094	93.227	1.48415	93.332
1.1	1.28520	95.745	1.32825	96.004	1.37466	96.246	1.42452	96.473	1.47797	96.684
1.15	1.27346	98.670	1.31691	99.058	1.36369	99.420	1.41395	99.758	1.46778	100.071
1.2	1.25726	101.661	1.30124	102.175	1.34858	102.656	1.39937	103.102	1.45371	103.516
1.25	1.23689	104.740	1.28152	105.379	1.32955	105.974	1.38105	106.526	1.43611	107.037
1.3	1.21248	107.933	1.25802	108.693	1.30693	109.398	1.35927	110.051	1.41519	110.653
1.35	1.18457	111.267	1.23115	112.143	1.28107	112.952	1.33444	113.699	1.39136	114.387
1.4	1.15356	114.772	1.20135	115.755	1.25246	116.601	1.30700	117.493	1.36505	118.257
1.45	1.12001	118.478	1.16917	119.559	1.22163	120.550	1.27748	121.457	1.33682	122.286
1.5	1.08453	122.422	1.13522	123.586	1.18918	124.647	1.24649	125.614	1.30723	126.493
1.55	1.04785	126.637	1.10024	127.865	1.15583	128.978	1.21471	129.986	1.27697	130.898
1.6	1.01079	131.160	1.06500	132.426	1.12234	133.567	1.18289	134.593	1.24674	135.517
1.65	0.97427	136.026	1.03041	137.298	1.08957	138.435	1.15184	139.453	1.21732	140.363
1.7	0.93932	141.263	0.99742	142.500	1.05843	143.599	1.12243	144.574	1.19227	145.443
1.75	0.90700	146.889	0.96705	148.045	1.02985	149.062	1.09553	149.961	1.16418	150.755
1.8	0.87846	152.907	0.94033	153.927	1.00481	154.819	1.07202	155.601	1.14209	156.288
1.85	0.85481	159.294	0.91828	160.123	0.98420	160.842	1.05273	161.471	1.12400	162.020
1.9	0.83706	165.998	0.90178	166.585	0.96883	167.091	1.03837	167.532	1.11056	167.915
1.95	0.82605	172.936	0.89157	173.241	0.95933	173.503	1.02951	173.730	1.10227	173.927
2.0	0.82232	180.000	0.88811	180.000	0.95612	180.000	1.02652	180.000	1.09948	180.000

Example. $\sinh(0.90 + i\,\underline{1.0}) = 1.43309 \angle 90^\circ$.

	x = 1.0		x = 1.05		x = 1.1		x = 1.15		x = 1.2	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	1.17520	0.000	1.25386	0.000	1.33565	0.000	1.42078	0.000	1.50946	0.000
0.05	1.17782	5.900	1.25631	5.748	1.33795	5.615	1.42294	5.497	1.51150	5.393
0.1	1.18552	11.748	1.26358	11.453	1.34478	11.192	1.42936	10.961	1.51755	10.757
0.15	1.19816	17.496	1.27540	17.071	1.35590	16.694	1.43983	16.361	1.52741	16.065
0.2	1.21515	23.105	1.29137	22.568	1.37093	22.092	1.45399	21.670	1.54077	21.294
0.25	1.23594	28.541	1.31095	27.915	1.38939	27.359	1.47141	26.864	1.55721	26.421
0.3	1.25984	33.784	1.33351	33.093	1.41070	32.477	1.49155	31.926	1.57626	31.433
0.35	1.28612	38.821	1.35837	38.090	1.43421	37.435	1.51381	36.847	1.59733	36.319
0.4	1.31400	43.651	1.38479	42.902	1.45926	42.227	1.53756	41.620	1.61987	41.073
0.45	1.34272	48.276	1.41207	47.530	1.48517	46.855	1.56217	46.245	1.64325	45.693
0.5	1.37153	52.707	1.43950	51.981	1.51128	51.323	1.58701	50.725	1.66688	50.184
0.55	1.39976	56.957	1.46641	56.268	1.53694	55.640	1.61147	55.069	1.69018	54.549
0.6	1.42675	61.043	1.49220	60.403	1.56156	59.818	1.63497	59.284	1.71260	58.797
0.65	1.45193	64.981	1.51630	64.401	1.58460	63.870	1.65699	63.384	1.73363	62.939
0.7	1.47479	68.791	1.53820	68.280	1.60558	67.811	1.67705	67.380	1.75282	66.986
0.75	1.49487	72.491	1.55747	72.056	1.62404	71.656	1.69472	71.287	1.76975	70.950
0.8	1.51182	76.101	1.57374	75.747	1.63965	75.421	1.70971	75.120	1.78409	74.844
0.85	1.52532	79.638	1.58671	79.369	1.65211	79.121	1.72166	78.893	1.79555	78.682
0.9	1.53513	83.122	1.59614	82.941	1.66117	82.774	1.73036	82.620	1.80389	82.478
0.95	1.54108	86.724	1.60187	86.479	1.66667	86.395	1.73564	86.317	1.80895	86.246
1.0	1.54308	90.000	1.60379	90.000	1.66852	90.000	1.73741	90.000	1.81066	90.000
1.05	1.54108	93.276	1.60187	93.521	1.66667	93.605	1.73564	93.683	1.80895	93.754
1.1	1.53513	96.878	1.59614	97.059	1.66117	97.226	1.73036	97.380	1.80389	97.522
1.15	1.52532	100.362	1.58671	100.631	1.65211	100.879	1.72166	101.107	1.79555	101.318
1.2	1.51182	103.899	1.57374	104.253	1.63965	104.579	1.70971	104.880	1.78409	105.156
1.25	1.49487	107.509	1.55747	107.944	1.62404	108.344	1.69472	108.713	1.76975	109.050
1.3	1.47479	111.209	1.53820	111.720	1.60558	112.189	1.67705	112.620	1.75282	113.014
1.35	1.45193	115.019	1.51630	115.599	1.58460	116.130	1.65699	116.616	1.73363	117.061
1.4	1.42675	118.957	1.49220	119.597	1.56156	120.182	1.63497	120.716	1.71260	121.203
1.45	1.39976	123.043	1.46641	123.732	1.53694	124.360	1.61147	124.931	1.69018	125.451
1.5	1.37153	127.293	1.43950	128.019	1.51128	128.677	1.58701	129.275	1.66688	129.816
1.55	1.34272	131.724	1.41207	132.470	1.48517	133.145	1.56217	133.755	1.64325	134.307
1.6	1.31400	136.349	1.38479	137.098	1.45926	137.773	1.53756	138.380	1.61987	138.927
1.65	1.28612	141.179	1.35837	141.910	1.43421	142.565	1.51381	143.153	1.59733	143.681
1.7	1.25984	146.216	1.33351	146.907	1.41070	147.523	1.49155	148.074	1.57626	148.567
1.75	1.23594	151.459	1.31095	152.085	1.38939	152.641	1.47141	153.136	1.55721	153.579
1.8	1.21515	156.895	1.29137	157.432	1.37093	157.908	1.45399	158.330	1.54077	158.706
1.85	1.19816	162.504	1.27540	162.929	1.35590	163.306	1.43983	163.639	1.52741	163.935
1.9	1.18552	168.252	1.26358	168.547	1.34478	168.808	1.42936	169.039	1.51755	169.243
1.95	1.17782	174.100	1.25631	174.252	1.33795	174.385	1.42294	174.503	1.51150	174.607
2.00	1.17520	180.000	1.25386	180.000	1.33565	180.000	1.42078	180.000	1.50946	180.000

Example. $\sinh(1.20 + i\,\underline{1.25}) = 1.76975\ \underline{/109^\circ.050} = 1.76995\ \underline{/109^\circ.03'.00''}$.

	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	1.60192	0.000	1.69838	0.000	1.79909	0.000	1.90430	0.000	2.01427	0.000
0.05	1.60384	5.301	1.70019	5.218	1.80080	5.145	1.90592	5.080	2.01580	5.021
0.1	1.60954	10.576	1.70557	10.415	1.80588	10.271	1.91072	10.143	2.02034	10.028
0.15	1.61884	15.803	1.71435	15.568	1.81417	15.359	1.91856	15.172	2.02775	15.005
0.2	1.63145	20.958	1.72627	20.659	1.82544	20.392	1.92921	20.153	2.03784	19.939
0.25	1.64699	26.026	1.74096	25.673	1.83934	25.356	1.94237	25.073	2.05030	24.818
0.3	1.66501	30.991	1.75802	30.595	1.85549	30.240	1.95767	29.921	2.06479	29.634
0.35	1.68497	35.845	1.77694	35.418	1.87343	35.035	1.97468	34.689	2.08093	34.379
0.4	1.70635	40.580	1.79722	40.135	1.89268	39.735	1.99295	39.373	2.09828	39.047
0.45	1.72856	45.195	1.81832	44.745	1.91273	44.338	2.01200	43.970	2.11637	43.638
0.5	1.75104	49.693	1.83970	49.248	1.93306	48.845	2.03135	48.480	2.13478	48.150
0.55	1.77323	54.077	1.86084	53.648	1.95319	53.258	2.05051	52.905	2.15302	52.584
0.6	1.79462	58.354	1.88123	57.950	1.97262	57.583	2.06903	57.249	2.17067	56.945
0.65	1.81470	62.533	1.90040	62.163	1.99091	61.825	2.08647	61.518	2.18731	61.238
0.7	1.83304	66.625	1.91792	66.295	2.00764	65.994	2.10244	65.719	2.20254	65.469
0.75	1.84924	70.640	1.93341	70.356	2.02245	70.097	2.11658	69.861	2.21604	69.645
0.8	1.86297	74.590	1.94654	74.358	2.03500	74.145	2.12858	73.951	2.22751	73.774
0.85	1.87394	78.489	1.95704	78.311	2.04505	78.149	2.13819	78.000	2.23669	77.864
0.9	1.88193	82.348	1.96470	82.228	2.05238	82.118	2.14520	82.018	2.24334	81.925
0.95	1.88679	86.180	1.96935	86.120	2.05684	86.065	2.14947	86.014	2.24747	85.968
1.0	1.88842	90.000	1.97091	90.000	2.05833	90.000	2.15090	90.000	2.24884	90.000
1.05	1.88679	93.820	1.96935	93.880	2.05684	93.935	2.14947	93.986	2.24747	94.032
1.1	1.88193	97.652	1.96470	97.772	2.05238	97.882	2.14520	97.982	2.24334	98.075
1.15	1.87394	101.511	1.95704	101.689	2.04505	101.851	2.13819	102.000	2.23669	102.136
1.2	1.86297	105.410	1.94654	105.642	2.03500	105.855	2.12858	106.049	2.22751	106.226
1.25	1.84924	109.360	1.93341	109.644	2.02245	109.903	2.11658	110.139	2.21604	110.355
1.3	1.83304	113.375	1.91792	113.705	2.00764	114.006	2.10244	114.281	2.20254	114.531
1.35	1.81470	117.467	1.90040	117.837	1.99091	118.175	2.08647	118.482	2.18731	118.762
1.4	1.79462	121.646	1.88123	122.050	1.97262	122.417	2.06903	122.751	2.17067	123.055
1.45	1.77323	125.923	1.86084	126.352	1.95319	126.742	2.05051	127.095	2.15302	127.416
1.5	1.75104	130.308	1.83970	130.752	1.93306	131.155	2.03135	131.520	2.13478	131.851
1.55	1.72856	134.805	1.81832	135.255	1.91273	135.662	2.01200	136.030	2.11637	136.362
1.6	1.70635	139.420	1.79722	139.865	1.89268	140.265	1.99295	140.627	2.09828	140.953
1.65	1.68497	144.155	1.77694	144.582	1.87343	144.965	1.97468	145.311	2.08093	145.621
1.7	1.66501	149.009	1.75802	149.405	1.85549	149.760	1.95767	150.079	2.06479	150.366
1.75	1.64699	153.974	1.74096	154.327	1.83934	154.644	1.94237	154.927	2.05030	155.182
1.8	1.63145	159.042	1.72627	159.341	1.82544	159.608	1.92921	159.847	2.03784	160.061
1.85	1.61884	164.197	1.71435	164.432	1.81417	164.641	1.91856	164.828	2.02775	164.995
1.9	1.60954	169.424	1.70557	169.585	1.80588	169.729	1.91072	169.857	2.02034	169.972
1.95	1.60384	174.699	1.70019	174.782	1.80080	174.855	1.90592	174.920	2.01580	174.979
2.0	1.60192	180.000	1.69838	180.000	1.79909	180.000	1.90430	180.000	2.01427	180.000

Example. $\sinh(1.45 + i\,\underline{1.70}) = 2.06479 \underline{/150^\circ.366} = 2.06479 \underline{/150^\circ.22'.01''}$.

	$x = 1.50$		$x = 1.55$		$x = 1.60$		$x = 1.65$		$x = 1.70$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	2.12928	0.000	2.24961	0.000	2.37557	0.000	2.50746	0.000	2.64563	0.000
0.05	2.13073	4.969	2.25098	4.923	2.37686	4.881	2.50869	4.843	2.64679	4.809
0.1	2.13502	9.925	2.25504	9.833	2.38071	9.751	2.51234	9.677	2.65025	9.610
0.15	2.14204	14.855	2.26169	14.721	2.38701	14.600	2.51831	14.492	2.65591	14.395
0.2	2.15159	19.746	2.27074	19.574	2.39558	19.419	2.52644	19.280	2.66361	19.155
0.25	2.16340	24.590	2.28193	24.385	2.40619	24.200	2.53650	24.034	2.67316	23.884
0.3	2.17714	29.376	2.29496	29.144	2.41856	28.935	2.54824	28.747	2.68430	28.578
0.35	2.19245	34.099	2.30949	33.846	2.43235	33.619	2.56133	33.415	2.69673	33.229
0.4	2.20892	38.753	2.32513	38.488	2.44721	38.248	2.57544	38.032	2.71014	37.837
0.45	2.22612	43.337	2.34148	43.066	2.46274	42.820	2.59021	42.599	2.72418	42.398
0.5	2.24362	47.850	2.35812	47.580	2.47857	47.334	2.60527	47.113	2.73850	46.911
0.55	2.26098	52.294	2.37465	52.030	2.49430	51.791	2.62024	51.574	2.75274	51.378
0.6	2.27779	56.670	2.39066	56.420	2.50955	56.192	2.63476	55.986	2.76657	55.799
0.65	2.29365	60.984	2.40577	60.752	2.52395	60.542	2.64847	60.351	2.77963	60.178
0.7	2.30819	65.241	2.41976	65.033	2.53717	64.845	2.66108	64.673	2.79164	64.517
0.75	2.32107	69.448	2.43193	69.268	2.54890	69.105	2.67226	68.956	2.80230	68.821
0.8	2.33202	73.611	2.44238	73.464	2.55887	73.329	2.68178	73.206	2.81138	73.094
0.85	2.34080	77.740	2.45076	77.626	2.56687	77.523	2.68941	77.429	2.81867	77.343
0.9	2.34720	81.842	2.45688	81.765	2.57272	81.695	2.69499	81.631	2.82399	81.573
0.95	2.35110	85.925	2.46061	85.887	2.57627	85.851	2.69839	85.819	2.82723	85.790
1.0	2.35241	90.000	2.46186	90.000	2.57746	90.000	2.69951	90.000	2.82832	90.000
1.05	2.35110	94.075	2.46061	94.113	2.57627	94.149	2.69839	94.181	2.82723	94.210
1.1	2.34720	98.158	2.45688	98.235	2.57272	98.305	2.69499	98.369	2.82399	98.427
1.15	2.34080	102.260	2.45076	102.374	2.56687	102.477	2.68941	102.571	2.81867	102.657
1.2	2.33202	106.389	2.44238	106.536	2.55887	106.671	2.68178	106.794	2.81138	106.906
1.25	2.32107	110.552	2.43193	110.732	2.54890	110.895	2.67226	111.044	2.80230	111.179
1.3	2.30819	114.759	2.41976	114.967	2.53717	115.155	2.66108	115.327	2.79164	115.483
1.35	2.29365	119.016	2.40577	119.248	2.52395	119.458	2.64847	119.649	2.77963	119.822
1.4	2.27779	123.330	2.39066	123.580	2.50955	123.808	2.63476	124.014	2.76657	124.201
1.45	2.26098	127.706	2.37465	127.970	2.49430	128.209	2.62024	128.426	2.75274	128.622
1.5	2.24362	132.150	2.35812	132.421	2.47857	132.666	2.60527	132.887	2.73850	133.089
1.55	2.22612	136.663	2.34148	136.934	2.46274	137.180	2.59021	137.401	2.72418	137.602
1.6	2.20892	141.247	2.32513	141.512	2.44721	141.752	2.57544	141.968	2.71014	142.163
1.65	2.19245	145.901	2.30949	146.154	2.43235	146.381	2.56133	146.585	2.69673	146.771
1.7	2.17714	150.624	2.29496	150.856	2.41856	151.065	2.54824	151.253	2.68430	151.422
1.75	2.16340	155.410	2.28193	155.615	2.40619	155.800	2.53650	155.966	2.67316	156.116
1.8	2.15159	160.254	2.27074	160.426	2.39558	160.581	2.52644	160.720	2.66361	160.845
1.85	2.14204	165.145	2.26169	165.279	2.38701	165.400	2.51831	165.508	2.65591	165.605
1.9	2.13502	170.075	2.25504	170.167	2.38071	170.249	2.51234	170.323	2.65025	170.390
1.95	2.13073	175.031	2.25098	175.077	2.37686	175.119	2.50869	175.157	2.64679	175.191
2.0	2.12928	180.000	2.24961	180.000	2.37557	180.000	2.50746	180.000	2.64563	180.000

Example. $\sinh(1.55 + i\,\underline{0.60}) = 2.39066\ \underline{/56°.420} = 2.39066\ \underline{/56°.25'.12''}$.

TABLE X. HYPERBOLIC SINES. $\sinh (x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 1.75$		$x = 1.8$		$x = 1.85$		$x = 1.9$		$x = 1.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	2.79041	0.00	2.94217	0.00	3.10129	0.00	3.26816	0.00	3.44321	0.00
0.05	2.79151	4.779	2.94322	4.752	3.10228	4.727	3.26911	4.705	3.44410	4.685
0.1	2.79479	9.551	2.94633	9.497	3.10523	9.448	3.27191	9.405	3.44675	9.365
0.15	2.80016	14.307	2.95142	14.228	3.11006	14.158	3.27649	14.094	3.45112	14.036
0.2	2.80747	19.042	2.95835	18.941	3.11665	18.850	3.28274	18.767	3.45702	18.693
0.25	2.81653	23.750	2.96695	23.629	3.12481	23.520	3.29049	23.421	3.46441	23.332
0.3	2.82710	28.425	2.97699	28.287	3.13434	28.163	3.29955	28.051	3.47301	27.950
0.35	2.83891	33.063	2.98821	32.912	3.14500	32.776	3.30967	32.654	3.48263	32.543
0.4	2.85165	37.661	3.00031	37.501	3.15650	37.357	3.32060	37.227	3.49302	37.110
0.45	2.86499	42.216	3.01300	42.053	3.16856	41.904	3.33207	41.770	3.50393	41.649
0.5	2.87861	46.730	3.02595	46.565	3.18088	46.416	3.34378	46.281	3.51507	46.160
0.55	2.89217	51.200	3.03885	51.039	3.19315	50.893	3.35546	50.761	3.52617	50.642
0.6	2.90532	55.630	3.05138	55.476	3.20507	55.337	3.36681	55.211	3.53698	55.096
0.65	2.91777	60.020	3.06323	59.877	3.21636	59.748	3.37756	59.631	3.54721	59.524
0.7	2.92921	64.375	3.07413	64.246	3.22675	64.129	3.38745	64.023	3.55663	63.927
0.75	2.93938	68.698	3.08382	68.586	3.23598	68.484	3.39624	68.392	3.56500	68.308
0.8	2.94804	72.992	3.09206	72.900	3.24384	72.816	3.40373	72.740	3.57213	72.670
0.85	2.95498	77.265	3.09869	77.194	3.25015	77.129	3.40975	77.071	3.57788	77.017
0.9	2.96006	81.520	3.10353	81.471	3.25477	81.428	3.41415	81.388	3.58207	81.352
0.95	2.96315	85.763	3.10648	85.738	3.25759	85.716	3.41683	85.696	3.58462	85.678
1.0	2.96419	90.000	3.10747	90.000	3.25853	90.000	3.41773	90.000	3.58548	90.000
1.05	2.96315	94.237	3.10648	94.262	3.25759	94.284	3.41683	94.304	3.58462	94.322
1.1	2.96006	98.480	3.10353	98.529	3.25477	98.572	3.41415	98.612	3.58207	98.648
1.15	2.95498	102.735	3.09869	102.806	3.25015	102.871	3.40975	102.929	3.57788	102.983
1.2	2.94804	107.008	3.09206	107.100	3.24384	107.184	3.40373	107.260	3.57213	107.330
1.25	2.93938	111.302	3.08382	111.414	3.23598	111.516	3.39624	111.608	3.56500	111.692
1.3	2.92921	115.625	3.07413	115.754	3.22675	115.871	3.38745	115.977	3.55663	116.073
1.35	2.91777	119.980	3.06323	120.123	3.21636	120.252	3.37756	120.369	3.54721	120.476
1.4	2.90532	124.370	3.05138	124.524	3.20507	124.663	3.36681	124.789	3.53698	124.904
1.45	2.89217	128.800	3.03885	128.961	3.19315	129.107	3.35546	129.239	3.52617	129.358
1.5	2.87861	133.270	3.02595	133.435	3.18088	133.584	3.34378	133.719	3.51507	133.840
1.55	2.86499	137.784	3.01300	137.947	3.16856	138.096	3.33207	138.230	3.50393	138.351
1.6	2.85165	142.339	3.00031	142.499	3.15650	142.643	3.32060	142.773	3.49302	142.890
1.65	2.83891	146.937	2.98821	147.088	3.14500	147.224	3.30967	147.346	3.48263	147.457
1.7	2.82710	151.575	2.97699	151.713	3.13434	151.837	3.29955	151.949	3.47301	152.050
1.75	2.81653	156.250	2.96695	156.371	3.12481	156.480	3.29049	156.579	3.46441	156.668
1.8	2.80747	160.958	2.95835	161.059	3.11665	161.150	3.28274	161.233	3.45702	161.307
1.85	2.80016	165.693	2.95142	165.772	3.11006	165.842	3.27649	165.906	3.45112	165.964
1.9	2.79479	170.449	2.94633	170.503	3.10523	170.552	3.27191	170.595	3.44675	170.635
1.95	2.79151	175.221	2.94322	175.248	3.10228	175.273	3.26911	175.295	3.44410	175.315
2.0	2.79041	180.000	2.94217	180.000	3.10129	180.000	3.26816	180.000	3.44321	180.000

Example. $\sinh (1.90 + i\, \underline{2.0}) = 3.26816 \underline{/180^\circ.0} = 3.26816 \overline{\backslash 180^\circ.0}$.

Table X. HYPERBOLIC SINES. $\sinh(x + iq) = r \underline{/\gamma}$. Continued

q	x = 2.0 r	x = 2.0 γ °	x = 2.05 r	x = 2.05 γ °	x = 2.1 r	x = 2.1 γ °	x = 2.15 r	x = 2.15 γ °	x = 2.2 r	x = 2.2 γ °
0	3.62686	0.000	2.81950	0.000	4.02186	0.000	4.23419	0.000	4.45711	0.000
0.05	3.62771	4.667	3.82039	4.651	4.02263	4.636	4.23491	4.623	4.45779	4.611
0.1	3.63023	9.330	3.82279	9.298	4.02490	9.269	4.23707	9.243	4.45985	9.220
0.15	3.63437	13.984	3.82671	13.938	4.02863	13.895	4.24061	13.857	4.46322	13.823
0.2	3.64000	18.626	3.83206	18.566	4.03371	18.511	4.24544	18.462	4.46780	18.418
0.25	3.64699	23.252	3.83870	23.180	4.04002	23.114	4.25145	23.055	4.47350	23.002
0.3	3.65517	27.858	3.84648	27.776	4.04740	27.701	4.25846	27.634	4.48017	27.573
0.35	3.66430	32.443	3.85515	32.353	4.05566	32.271	4.26630	32.197	4.48763	32.130
0.4	3.67418	37.004	3.86454	36.908	4.06459	36.821	4.27479	36.743	4.49570	36.671
0.45	3.68455	41.539	3.87440	41.440	4.07396	41.351	4.28371	41.270	4.50417	41.196
0.5	3.69515	46.049	3.88448	45.950	4.08355	45.859	4.29282	45.778	4.51285	45.703
0.55	3.70572	50.533	3.89453	50.435	4.09311	50.347	4.30193	50.266	4.52150	50.193
0.6	3.71600	54.992	3.90432	54.898	4.10243	54.813	4.31079	54.736	4.52993	54.666
0.65	3.72574	59.427	3.91359	59.340	4.11125	59.260	4.31918	59.188	4.53793	59.123
0.7	3.73470	63.840	3.92213	63.761	4.11938	63.689	4.32693	63.624	4.54529	63.565
0.75	3.74268	68.232	3.92972	68.164	4.12661	68.101	4.33381	68.044	4.55184	67.993
0.8	3.74948	72.608	3.93620	72.551	4.13278	72.499	4.33968	72.452	4.55744	72.409
0.85	3.75495	76.969	3.94142	76.925	4.13774	76.885	4.34440	76.849	4.56167	76.816
0.9	3.75894	81.319	3.94521	81.289	4.14136	81.262	4.34785	81.237	4.56523	81.215
0.95	3.76137	85.661	3.94753	85.646	4.14357	85.632	4.34996	85.620	4.56723	85.609
1.0	3.76220	90.000	3.94832	90.000	4.14431	90.000	4.35067	90.000	4.56791	90.000
1.05	3.76137	94.339	3.94753	94.354	4.14357	94.368	4.34996	94.380	4.56723	94.391
1.1	3.75894	98.681	3.94521	98.711	4.14136	98.738	4.34785	98.763	4.56523	98.785
1.15	3.75495	103.031	3.94142	103.075	4.13774	103.115	4.34440	103.151	4.56167	103.184
1.2	3.74948	107.392	3.93620	107.449	4.13278	107.501	4.33968	107.548	4.55744	107.591
1.25	3.74268	111.768	3.92972	111.836	4.12661	111.899	4.33381	111.956	4.55184	112.007
1.3	3.73470	116.160	3.92213	116.239	4.11938	116.311	4.32693	116.376	4.54529	116.435
1.35	3.72574	120.573	3.91359	120.660	4.11125	120.740	4.31918	120.812	4.53793	120.877
1.4	3.71600	125.008	3.90432	125.102	4.10243	125.187	4.31079	125.264	4.52993	125.334
1.45	3.70572	129.467	3.89453	129.565	4.09311	129.653	4.30193	129.734	4.52150	129.807
1.5	3.69515	133.951	3.88448	134.051	4.08355	134.141	4.29282	134.223	4.51285	134.297
1.55	3.68455	138.461	3.87440	138.560	4.07396	138.649	4.28371	138.730	4.50417	138.804
1.6	3.67418	142.996	3.86454	143.092	4.06459	143.179	4.27479	143.257	4.49570	143.329
1.65	3.66430	147.557	3.85515	147.647	4.05566	147.729	4.26630	147.803	4.48763	147.870
1.7	3.65517	152.142	3.84648	152.224	4.04740	152.299	4.25846	152.366	4.48017	152.427
1.75	3.64699	156.748	3.83870	156.820	4.04002	156.886	4.25145	156.945	4.47350	156.998
1.8	3.64000	161.374	3.83206	161.434	4.03371	161.489	4.24544	161.538	4.46780	161.582
1.85	3.63437	166.016	3.82671	166.062	4.02863	166.105	4.24061	166.143	4.46322	166.177
1.9	3.63023	170.670	3.82279	170.702	4.02490	170.731	4.23707	170.757	4.45985	170.780
1.95	3.62771	175.333	3.82039	175.349	4.02263	175.364	4.23491	175.377	4.45779	175.389
2.0	3.62686	180.000	3.81958	180.000	4.02186	180.000	4.23419	180.000	4.45711	180.000

Example. $\sinh(2.0 + i\,\underline{1.0}) = 3.76220 \underline{/90°}$.

	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	4.69117	0.000	4.93696	0.000	5.19510	0.000	5.46623	0.000	5.75103	0.000
0.05	4.69182	4.601	4.93759	4.591	5.19569	4.582	5.46679	4.574	5.75156	4.567
0.1	4.69377	9.199	4.93944	9.180	5.19745	9.163	5.46847	9.147	5.75316	9.133
0.15	4.69697	13.792	4.94249	13.764	5.20035	13.739	5.47122	13.716	5.75576	13.695
0.2	4.70134	18.378	4.94662	18.341	5.20428	18.309	5.47495	18.279	5.75932	18.252
0.25	4.70675	22.954	4.95177	22.910	5.20917	22.871	5.47961	22.835	5.76375	22.803
0.3	4.71308	27.518	4.95780	27.469	5.21490	27.424	5.48505	27.383	5.76892	27.347
0.35	4.72017	32.070	4.96454	32.016	5.22131	31.966	5.49115	31.922	5.77472	31.881
0.4	4.72784	36.608	4.97183	36.549	5.22825	36.497	5.49775	36.449	5.78099	36.407
0.45	4.73592	41.130	4.97950	41.070	5.23553	41.016	5.50468	40.966	5.78758	40.922
0.5	4.74415	45.636	4.98734	45.576	5.23728	45.521	5.51177	45.471	5.79434	45.427
0.55	4.75240	50.127	4.99518	50.068	5.25046	50.014	5.51887	49.965	5.80108	49.921
0.6	4.76042	54.603	5.00281	54.546	5.25772	54.494	5.52578	54.447	5.80765	54.405
0.65	4.76802	59.064	5.01005	59.011	5.26461	58.962	5.53233	58.919	5.81389	58.879
0.7	4.77503	63.512	5.01672	63.463	5.27096	63.419	5.53837	63.380	5.81964	63.344
0.75	4.78127	67.947	5.02265	67.904	5.27662	67.866	5.54375	67.831	5.82476	67.800
0.8	4.78661	72.371	5.02773	72.336	5.28143	72.304	5.54834	72.275	5.82913	72.249
0.85	4.79088	76.786	5.03181	76.759	5.28531	76.735	5.55204	76.712	5.83265	76.692
0.9	4.79402	81.195	5.03479	81.176	5.28816	81.160	5.55474	81.144	5.83522	81.131
0.95	4.79593	85.599	5.03661	85.589	5.28989	85.581	5.55639	85.573	5.83680	85.566
1.0	4.79657	90.000	5.03722	90.000	5.29047	90.000	5.55695	90.000	5.83732	90.000
1.05	4.79593	94.401	5.03661	94.411	5.28989	94.419	5.55639	94.427	5.83680	94.434
1.1	4.79402	98.805	5.03479	98.824	5.28816	98.840	5.55474	98.856	5.83522	98.869
1.15	4.79088	103.214	5.03181	103.241	5.28531	103.265	5.55204	103.288	5.83265	103.308
1.2	4.78661	107.629	5.02773	107.664	5.28143	107.696	5.54834	107.725	5.82913	107.751
1.25	4.78127	112.053	5.02265	112.096	5.27662	112.134	5.54375	112.169	5.82476	112.200
1.3	4.77503	116.488	5.01672	116.537	5.27096	116.581	5.53837	116.620	5.81964	116.656
1.35	4.76802	120.936	5.01005	120.989	5.26461	121.038	5.53233	121.081	5.81389	121.121
1.4	4.76042	125.397	5.00281	125.454	5.25772	125.506	5.52578	125.553	5.80765	125.595
1.45	4.75240	129.873	4.99518	129.932	5.25046	129.986	5.51887	130.035	5.80108	130.079
1.5	4.74415	134.364	4.98734	134.424	5.23728	134.479	5.51177	134.529	5.79434	134.573
1.55	4.73592	138.870	4.97950	138.930	5.23553	138.984	5.50468	139.034	5.78758	139.078
1.6	4.72784	143.392	4.97183	143.451	5.22825	143.503	5.49775	143.551	5.78099	143.593
1.65	4.72017	147.930	4.96454	147.984	5.22131	148.034	5.49115	148.078	5.77472	148.119
1.7	4.71308	152.482	4.95780	152.531	5.21490	152.576	5.48505	152.617	5.76982	152.653
1.75	4.70675	157.046	4.95177	157.090	5.20917	157.129	5.47961	157.165	5.76375	157.197
1.8	4.70134	161.622	4.94662	161.659	5.20428	161.691	5.47495	161.721	5.75932	161.748
1.85	4.69697	166.208	4.94249	166.236	5.20035	166.261	5.47122	166.284	5.75576	166.305
1.9	4.69377	170.801	4.93944	170.820	5.19745	170.837	5.46847	170.853	5.75316	170.867
1.95	4.69182	175.399	4.93759	175.409	5.19569	175.418	5.46679	175.426	5.75156	175.433
2.0	4.69117	180.000	4.93696	180.000	5.19510	180.000	5.46623	180.000	5.75103	180.000

Example. $\sinh(2.40 + i\,\underline{0.4}) = 5.49775 \angle 36°.449 = 5.49775 \angle 36°.26'.56''$.

	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	6.05020	0.000	6.36451	0.000	6.69473	0.000	7.04169	0.000	7.40626	0.000
0.05	6.05071	4.561	6.36499	4.555	6.69518	4.550	7.04213	4.545	7.40668	4.540
0.1	6.05223	9.120	6.36644	9.109	6.69656	9.098	7.04343	9.089	7.40791	9.080
0.15	6.05471	13.676	6.36879	13.660	6.69880	13.644	7.04556	13.631	7.40994	13.618
0.2	6.05808	18.228	6.37201	18.206	6.70185	18.187	7.04847	18.169	7.41271	18.153
0.25	6.06229	22.774	6.37601	22.748	6.70565	22.725	7.05208	22.703	7.41614	22.684
0.3	6.06722	27.314	6.38068	27.284	6.71011	27.257	7.05631	27.232	7.42017	27.210
0.35	6.07273	31.845	6.38592	31.812	6.71509	31.782	7.06105	31.756	7.42467	31.731
0.4	6.07869	36.368	6.39160	36.333	6.72048	36.301	7.06618	36.273	7.42955	36.246
0.45	6.08496	40.882	6.39755	40.845	6.72616	40.813	7.07158	40.783	7.43468	40.756
0.5	6.09139	45.386	6.40367	45.350	6.73197	45.316	7.07711	45.286	7.43994	45.259
0.55	6.09781	49.881	6.40977	49.845	6.73778	49.812	7.08264	49.782	7.44519	49.755
0.6	6.10406	54.366	6.41572	54.332	6.74343	54.300	7.08802	54.272	7.45032	54.246
0.65	6.10999	58.843	6.42137	58.810	6.74881	58.781	7.09313	58.754	7.45518	58.730
0.7	6.11547	63.311	6.42658	63.282	6.75376	63.255	7.09784	63.230	7.45966	63.209
0.75	6.12034	67.772	6.43121	67.746	6.75818	67.722	7.10204	67.701	7.46366	67.682
0.8	6.12450	72.226	6.43518	72.204	6.76195	72.185	7.10563	72.167	7.46708	72.152
0.85	6.12785	76.674	6.43836	76.658	6.76499	76.643	7.10851	76.629	7.46982	76.617
0.9	6.13030	81.119	6.44069	81.107	6.76720	81.097	7.11062	81.088	7.47183	81.080
0.95	6.13179	85.560	6.44212	85.554	6.76855	85.549	7.11191	85.544	7.47306	85.540
1.00	6.13229	90.000	6.44259	90.000	6.76901	90.000	7.11234	90.000	7.47347	90.000
1.05	6.13179	94.440	6.44212	94.446	6.76855	94.451	7.11191	94.456	7.47306	94.460
1.1	6.13030	98.881	6.44069	98.893	6.76720	98.903	7.11062	98.912	7.47183	98.920
1.15	6.12785	103.326	6.43836	103.342	6.76499	103.357	7.10851	103.371	7.46982	103.383
1.2	6.12450	107.774	6.43518	107.796	6.76195	107.815	7.10563	107.833	7.46708	107.848
1.25	6.12034	112.228	6.43121	112.254	6.75818	112.278	7.10204	112.299	7.46366	112.318
1.3	6.11547	116.689	6.42658	116.718	6.75376	116.745	7.09784	116.770	7.45966	116.791
1.35	6.10999	121.157	6.42137	121.190	6.74881	121.219	7.09313	121.246	7.45518	121.270
1.4	6.10406	125.634	6.41572	125.668	6.74343	125.700	7.08802	125.728	7.45032	125.754
1.45	6.09781	130.119	6.40977	130.155	6.73778	130.188	7.08264	130.218	7.44519	130.245
1.5	6.09139	134.614	6.40367	134.651	6.73197	134.684	7.07711	134.713	7.43994	134.741
1.55	6.08496	139.118	6.39755	139.155	6.72616	139.187	7.07158	139.217	7.43468	139.244
1.6	6.07869	143.632	6.39160	143.667	6.72048	143.699	7.06618	143.727	7.42955	143.754
1.65	6.07273	148.155	6.38592	148.188	6.71509	148.218	7.06105	148.244	7.42467	148.269
1.7	6.06722	152.686	6.38068	152.716	6.71011	152.743	7.05631	152.768	7.42017	152.790
1.75	6.06229	157.226	6.37601	157.252	6.70565	157.275	7.05208	157.297	7.41614	157.316
1.8	6.05808	161.772	6.37201	161.794	6.70185	161.813	7.04847	161.831	7.41271	161.847
1.85	6.05471	166.324	6.36879	166.340	6.69880	166.356	7.04566	166.369	7.40994	166.382
1.9	6.05223	170.880	6.36644	170.891	6.69656	170.902	7.04343	170.911	7.40791	170.920
1.95	6.05071	175.439	6.36499	175.445	6.69518	175.450	7.04213	175.455	7.40668	175.460
2.0	6.05020	180.000	6.36451	180.000	6.69473	180.000	7.04169	180.000	7.40626	180.000

Example. $\sinh(2.6 + i\,\underline{0.6}) = 6.74343\ \underline{/54^\circ.300} = 6.74343\ \underline{/54^\circ.18'00''}$.

	x = 2.75		x = 2.8		x = 2.85		x = 2.9		x = 2.95	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	7.78935	0.000	8.19192	0.000	8.61497	0.000	9.05956	0.000	9.52681	0.000
0.05	7.78975	4.537	8.19230	4.533	8.61532	4.530	9.05990	4.527	9.52713	4.525
0.1	7.79092	9.073	8.19341	9.066	8.61639	9.060	9.06091	9.054	9.52809	9.049
0.15	7.79285	13.607	8.19524	13.596	8.61813	13.587	9.06257	13.579	9.52967	13.571
0.2	7.79547	18.138	8.19774	18.125	8.62051	18.113	9.06483	18.102	9.53182	18.093
0.25	7.79875	22.666	8.20085	22.650	8.62347	22.636	9.06764	22.623	9.53450	22.611
0.3	7.80257	27.190	8.20449	27.172	8.62691	27.155	9.07093	27.141	9.53762	27.127
0.35	7.80685	31.709	8.20857	31.689	8.63080	31.671	9.07461	31.655	9.54113	31.640
0.4	7.81149	36.223	8.21298	36.202	8.63500	36.183	9.07861	36.165	9.54492	36.150
0.45	7.81637	40.731	8.21762	40.710	8.63941	40.690	9.08281	40.671	9.54892	40.655
0.5	7.82138	45.234	8.22238	45.212	8.64395	45.192	9.08711	45.173	9.55301	45.157
0.55	7.82638	49.731	8.22713	49.709	8.64846	49.689	9.09142	49.671	9.55711	49.655
0.6	7.83125	54.222	8.23177	54.201	8.65287	54.182	9.09561	54.165	9.56109	54.149
0.65	7.83588	58.708	8.23617	58.688	8.65706	58.670	9.09959	58.654	9.56488	58.640
0.7	7.84015	63.189	8.24024	63.171	8.66092	63.155	9.10327	63.140	9.56838	63.127
0.75	7.84395	67.665	8.24385	67.649	8.66436	67.636	9.10655	67.622	9.57150	67.611
0.8	7.84720	72.137	8.24694	72.124	8.66731	72.112	9.10934	72.102	9.57416	72.092
0.85	7.84980	76.606	8.24942	76.596	8.66967	76.587	9.11160	76.579	9.57630	76.571
0.9	7.85172	81.072	8.25124	81.065	8.67140	81.059	9.11324	81.053	9.57787	81.048
0.95	7.85288	85.536	8.25235	85.533	8.67246	85.530	9.11424	85.527	9.57882	85.524
1.0	7.85328	90.000	8.25273	90.000	8.67281	90.000	9.11458	90.000	9.57915	90.000
1.05	7.85288	94.464	8.25235	94.467	8.67246	94.470	9.11424	94.473	9.57882	94.476
1.1	7.85172	98.928	8.25124	98.935	8.67140	98.941	9.11324	98.947	9.57787	98.952
1.15	7.84980	103.394	8.24942	103.404	8.66967	103.413	9.11160	103.421	9.57630	103.429
1.2	7.84720	107.863	8.24694	107.876	8.66731	107.888	9.10934	107.898	9.57416	107.908
1.25	7.84395	112.335	8.24385	112.351	8.66436	112.364	9.10655	112.378	9.57150	112.389
1.3	7.84015	116.811	8.24024	116.829	8.66092	116.845	9.10327	116.860	9.56838	116.873
1.35	7.83588	121.292	8.23617	121.312	8.65706	121.330	9.09959	121.346	9.56488	121.360
1.4	7.83125	125.778	8.23177	125.799	8.65287	125.818	9.09561	125.835	9.56109	125.851
1.45	7.82638	130.269	8.22713	130.291	8.64846	130.311	9.09142	130.329	9.55711	130.345
1.5	7.82138	134.766	8.22238	134.788	8.64395	134.808	9.08711	134.827	9.55301	134.843
1.55	7.81637	139.269	8.21762	139.290	8.63941	139.310	9.08281	139.329	9.54892	139.345
1.6	7.81149	143.777	8.21298	143.798	8.63500	143.817	9.07861	143.835	9.54492	143.850
1.65	7.80685	148.291	8.20857	148.311	8.63080	148.329	9.07461	148.345	9.54113	148.360
1.7	7.80257	152.810	8.20449	152.828	8.62691	152.845	9.07093	152.859	9.53762	152.873
1.75	7.79875	157.334	8.20085	157.350	8.62347	157.364	9.06764	157.377	9.53450	157.389
1.8	7.79547	161.862	8.19774	161.875	8.62051	161.887	9.06483	161.898	9.53182	161.907
1.85	7.79285	166.393	8.19524	166.404	8.61813	166.413	9.06257	166.421	9.52967	166.429
1.9	7.79092	170.927	8.19341	170.934	8.61639	170.940	9.06091	170.946	9.52809	170.951
1.95	7.78975	175.463	8.19230	175.467	8.61532	175.470	9.05990	175.473	9.52713	175.475
2.0	7.78935	180.000	8.19192	180.000	8.61497	180.000	9.05956	180.000	9.52681	180.000

Example. $\sinh (2.95 + i\, \underline{1.95}) = 9.52713\ \underline{/175^\circ.475} = 9.52713\ \underline{/175^\circ.28'.30''}$.

	x = 3.0		x = 3.05		x = 3.1		x = 3.15		x = 3.2	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	10.01787	0.000	10.53399	0.000	11.07645	0.000	11.64661	0.000	12.24588	0.000
0.05	10.01820	4.522	10.53430	4.520	11.07670	4.518	11.64690	4.516	12.24610	4.515
0.1	10.01910	9.044	10.53520	9.040	11.07750	9.036	11.64770	9.033	12.24690	9.030
0.15	10.02060	13.565	10.53660	13.559	11.07890	13.553	11.64890	13.548	12.24810	13.543
0.2	10.02260	18.084	10.53850	18.076	11.08080	18.068	11.65070	18.062	12.24980	18.056
0.25	10.02520	22.601	10.54090	22.591	11.08310	22.583	11.65290	22.575	12.25180	22.568
0.3	10.02820	27.115	10.54380	27.104	11.08580	27.094	11.65540	27.085	12.25430	27.077
0.35	10.03150	31.627	10.54690	31.615	11.08880	31.604	11.65830	31.594	12.25700	31.585
0.4	10.03510	36.135	10.55040	36.122	11.09200	36.111	11.66140	36.100	12.26000	36.091
0.45	10.03890	40.640	10.55400	40.627	11.09540	40.615	11.66470	40.604	12.26310	40.594
0.5	10.04280	45.142	10.55770	45.129	11.09900	45.116	11.66810	45.105	12.26630	45.095
0.55	10.04670	49.640	10.56140	49.627	11.10250	49.615	11.67140	49.604	12.26950	49.594
0.6	10.05050	54.135	10.56500	54.122	11.10600	54.110	11.67470	54.100	12.27260	54.090
0.65	10.05410	58.626	10.56840	58.614	11.10920	58.604	11.67780	58.594	12.27550	58.585
0.7	10.05743	63.114	10.57160	63.104	11.11220	63.094	11.68060	63.085	12.27820	63.077
0.75	10.06040	67.600	10.57440	67.591	11.11490	67.582	11.68320	67.574	12.28070	67.567
0.8	10.06292	72.083	10.57680	72.075	11.11720	72.068	11.68540	72.062	12.28280	72.056
0.85	10.06500	76.564	10.57880	76.558	11.11900	76.553	11.68710	76.548	12.28440	76.543
0.9	10.06645	81.044	10.58020	81.040	11.12040	81.036	11.68840	81.032	12.28560	81.029
0.95	10.06737	85.522	10.58110	85.520	11.12120	85.518	11.68920	85.516	12.28640	85.515
1.0	10.06766	90.000	10.58135	90.000	11.12150	90.000	11.68946	90.000	12.28665	90.000
1.05	10.06737	94.478	10.58110	94.480	11.12120	94.482	11.68920	94.484	12.28640	94.485
1.1	10.06645	98.956	10.58020	98.960	11.12040	98.964	11.68840	98.968	12.28560	98.971
1.15	10.06500	103.436	10.57880	103.442	11.11900	103.447	11.68710	103.452	12.28440	103.457
1.2	10.06292	107.917	10.57680	107.925	11.11720	107.932	11.68540	107.938	12.28280	107.944
1.25	10.06040	112.400	10.57440	112.409	11.11490	112.418	11.68320	112.426	12.28070	112.433
1.3	10.05743	116.886	10.57160	116.896	11.11220	116.906	11.68060	116.915	12.27820	116.923
1.35	10.05410	121.374	10.56840	121.386	11.10920	121.396	11.67780	121.406	12.27550	121.415
1.4	10.05050	125.856	10.56500	125.878	11.10600	125.890	11.67470	125.900	12.27260	125.910
1.45	10.04670	130.360	10.56140	130.373	11.10250	130.385	11.67140	130.396	12.26950	130.406
1.5	10.04280	134.858	10.55770	134.871	11.09900	134.884	11.66810	134.895	12.26630	134.905
1.55	10.03890	139.360	10.55400	139.373	11.09540	139.385	11.66470	139.396	12.26310	139.406
1.6	10.03510	143.865	10.55040	143.878	11.09200	143.889	11.66140	143.900	12.26000	143.909
1.65	10.03150	148.373	10.54690	148.385	11.08880	148.396	11.65830	148.406	12.25700	148.415
1.7	10.02820	152.885	10.54380	152.896	11.08580	152.906	11.65540	152.915	12.25430	152.923
1.75	10.02520	157.399	10.54090	157.409	11.08310	157.417	11.65290	157.425	12.25180	157.432
1.8	10.02260	161.916	10.53850	161.924	11.08080	161.931	11.65070	161.938	12.24980	161.944
1.85	10.02060	166.435	10.53660	166.441	11.07890	166.447	11.64890	166.452	12.24810	166.457
1.9	10.01910	170.956	10.53520	170.960	11.07750	170.964	11.64770	170.967	12.24690	170.970
1.95	10.01820	175.478	10.53430	175.480	11.07670	175.482	11.64690	175.484	12.24610	175.485
2.0	10.01787	180.000	10.53399	180.000	11.07645	180.000	11.64661	180.000	12.24588	180.000

Example. sinh $(3.2 + i\,\underline{1.1}) = 12.28560\,\underline{/98°.971} = 12.28560\,\underline{/98°.58'.16''}$.

TABLE X. HYPERBOLIC SINES. $\sinh(x + iq) = r \angle \gamma$. CONTINUED

	$x = 3.25$		$x = 3.3$		$x = 3.35$		$x = 3.4$		$x = 3.45$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	12.87578	0.000	13.53788	0.000	14.23382	0.000	14.96536	0.000	15.73432	0.000
0.05	12.87600	4.514	13.53810	4.512	14.23403	4.511	14.96556	4.510	15.73450	4.509
0.1	12.87670	9.027	13.53878	9.024	14.23470	9.022	14.96616	9.020	15.73510	9.018
0.15	12.87790	13.539	13.53991	13.536	14.23573	13.532	14.96716	13.529	15.73603	13.526
0.2	12.87949	18.051	13.54141	18.046	14.23718	18.041	14.96855	18.038	15.73736	18.034
0.25	12.88146	22.561	13.54322	22.555	14.23897	22.550	14.97023	22.545	15.73898	22.541
0.3	12.88380	27.070	13.54550	27.063	14.24106	27.057	14.97225	27.052	15.74088	27.047
0.35	12.88637	31.577	13.54796	31.569	14.24339	31.563	14.97448	31.557	15.74300	31.551
0.4	12.88910	36.082	13.55062	36.074	14.24595	36.067	14.97690	36.061	15.74529	36.055
0.45	12.89215	40.585	13.55346	40.577	14.24863	40.570	14.97945	40.563	15.74772	40.557
0.5	12.89518	45.086	13.55633	45.078	14.25137	45.071	14.98205	45.064	15.75020	45.058
0.55	12.89820	49.585	13.55918	49.577	14.25412	49.570	14.98466	49.563	15.75270	49.557
0.6	12.90117	54.082	13.56203	54.074	14.25614	54.067	14.98721	54.061	15.75510	54.055
0.65	12.90398	58.577	13.56470	58.569	14.25933	58.563	14.98960	58.557	15.75740	58.551
0.7	12.90658	63.070	13.56718	63.063	14.26167	63.057	14.99186	63.052	15.75950	63.047
0.75	12.90888	67.561	13.56936	67.555	14.26377	67.550	14.99385	67.545	15.76144	67.541
0.8	12.91085	72.051	13.57123	72.046	14.26556	72.041	14.99555	72.038	15.76303	72.034
0.85	12.91240	76.539	13.57275	76.535	14.26700	76.532	14.99692	76.529	15.76433	76.526
0.9	12.91360	81.027	13.57387	81.024	14.26805	81.022	14.99790	81.020	15.76530	81.018
0.95	12.91430	85.514	13.57455	85.512	14.26870	85.511	14.99853	85.510	15.76587	85.509
1.0	12.91456	90.000	13.57476	90.000	14.26891	90.000	14.99874	90.000	15.76607	90.000
1.05	12.91430	94.486	13.57455	94.488	14.26870	94.489	14.99853	94.490	15.76587	94.491
1.1	12.91360	98.973	13.57387	98.976	14.26805	98.978	14.99790	98.980	15.76530	98.982
1.15	12.91240	103.461	13.57275	103.465	14.26700	103.468	14.99692	103.471	15.76433	103.474
1.2	12.91085	107.949	13.57123	107.954	14.26556	107.959	14.99555	107.963	15.76303	107.966
1.25	12.90888	112.439	13.56936	112.445	14.26377	112.450	14.99385	112.455	15.76144	112.459
1.3	12.90658	116.930	13.56718	116.937	14.26167	116.943	14.99186	116.948	15.75950	116.953
1.35	12.90398	121.423	13.56470	121.431	14.25933	121.437	14.98960	121.443	15.75740	121.449
1.4	12.90117	125.918	13.56203	125.926	14.25614	125.933	14.98721	125.939	15.75510	125.945
1.45	12.89820	130.415	13.55918	130.423	14.25412	130.430	14.98466	130.437	15.75270	130.443
1.5	12.89518	134.914	13.55633	134.922	14.25137	134.929	14.98205	134.936	15.75020	134.942
1.55	12.89215	139.415	13.55346	139.423	14.24863	139.430	14.97945	139.437	15.74772	139.443
1.6	12.88910	143.918	13.55062	143.926	14.24595	143.933	14.97690	143.939	15.74529	143.945
1.65	12.88637	148.423	13.54796	148.431	14.24339	148.437	14.97448	148.443	15.74300	148.449
1.7	12.88380	152.930	13.54550	152.937	14.24106	152.943	14.97225	152.948	15.74088	152.953
1.75	12.88146	157.439	13.54322	157.445	14.23897	157.450	14.97023	157.455	15.73898	157.459
1.8	12.87949	161.949	13.54141	161.954	14.23718	161.959	14.96855	161.962	15.73736	161.966
1.85	12.87790	166.461	13.53991	166.464	14.23573	166.468	14.96716	166.471	15.73603	166.474
1.9	12.87670	170.973	13.53878	170.976	14.23470	170.978	14.96616	170.980	15.73510	170.982
1.95	12.87600	175.486	13.53810	175.488	14.23403	175.489	14.96556	175.490	15.73450	175.491
2.0	12.87578	180.000	13.53788	180.000	14.23382	180.000	14.96536	180.000	15.73432	180.000

Example. $\sinh(3.3 + i\,\underline{1.3}) = 13.56718 \angle 116°.937 = 13.56718 \angle 116°.56'.13''$.

TABLE X. HYPERBOLIC SINES. $\sinh (x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 3.5$		$x = 3.55$		$x = 3.6$		$x = 3.65$		$x = 3.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	16.54263	0.000	17.39230	0.000	18.28546	0.000	19.22434	0.000	20.21129	0.000
0.05	16.54281	4.508	17.39248	4.507	18.28560	4.507	19.22448	4.506	20.21140	4.506
0.1	16.54337	9.016	17.39300	9.015	18.28611	9.013	19.22496	9.012	20.21189	9.011
0.15	16.54428	13.524	17.39386	13.522	18.28694	13.519	19.22577	13.518	20.21268	13.516
0.2	16.54550	18.031	17.39504	18.028	18.28805	18.025	19.22681	18.023	20.21365	18.021
0.25	16.54702	22.537	17.39650	22.534	18.28942	22.530	19.22813	22.527	20.21490	22.525
0.3	16.54885	27.042	17.39822	27.038	18.29109	27.035	19.22968	27.031	20.21639	27.028
0.35	16.55087	31.547	17.40015	31.542	18.29292	31.538	19.23142	31.535	20.21804	31.531
0.4	16.55307	36.050	17.40222	36.045	18.29490	36.041	19.23331	36.037	20.21981	36.033
0.45	16.55538	40.552	17.40441	40.547	18.29699	40.542	19.23530	40.538	20.22170	40.535
0.5	16.55774	45.052	17.40665	45.047	18.29912	45.043	19.23732	45.039	20.22365	45.035
0.55	16.56010	49.552	17.40900	49.547	18.30126	49.542	19.23940	49.538	20.22560	49.535
0.6	16.56240	54.050	17.41110	54.045	18.30335	54.041	19.24134	54.037	20.22750	54.033
0.65	16.56460	58.547	17.41310	58.542	18.30530	58.538	19.24323	58.535	20.22930	58.531
0.7	16.56660	63.042	17.41510	63.038	18.30715	63.035	19.24496	63.031	20.23090	63.028
0.75	16.56840	67.537	17.41680	67.533	18.30880	67.530	19.24650	67.527	20.23240	67.525
0.8	16.56996	72.031	17.41830	72.028	18.31020	72.025	19.24790	72.023	20.23365	72.021
0.85	16.57120	76.524	17.41945	76.521	18.31130	76.519	19.24890	76.518	20.23460	76.516
0.9	16.57210	81.016	17.42030	81.015	18.31210	81.013	19.24970	81.012	20.23540	81.011
0.95	16.57260	85.508	17.42083	85.507	18.31260	85.507	19.25015	85.506	20.23585	85.506
1.0	16.57282	90.000	17.42102	90.000	18.31278	90.000	19.25033	90.000	20.23601	90.000
1.05	16.57260	94.492	17.42083	94.493	18.31260	94.493	19.25015	94.494	20.23585	94.494
1.1	16.57210	98.984	17.42030	98.985	18.31210	98.987	19.24970	98.988	20.23540	98.989
1.15	16.57120	103.476	17.41945	103.479	18.31130	103.480	19.24890	103.482	20.23460	103.484
1.2	16.56996	107.969	17.41830	107.972	18.31020	107.975	19.24790	107.977	20.23365	107.979
1.25	16.56840	112.463	17.41680	112.467	18.30880	112.470	19.24650	112.473	20.23240	112.475
1.3	16.56660	116.958	17.41510	116.962	18.30715	116.965	19.24496	116.969	20.23090	116.972
1.35	16.56460	121.453	17.41310	121.458	18.30530	121.462	19.24323	121.465	20.22930	121.469
1.4	16.56240	125.950	17.41110	125.955	18.30335	125.959	19.24134	125.963	20.22750	125.967
1.45	16.56010	130.448	17.40900	130.453	18.30126	130.458	19.23940	130.462	20.22560	130.465
1.5	16.55774	134.948	17.40665	134.953	18.29912	134.957	19.23732	134.961	20.22365	134.965
1.55	16.55538	139.448	17.40441	139.453	18.29699	139.458	19.23530	139.462	20.22170	139.465
1.6	16.55307	143.950	17.40222	143.955	18.29490	143.959	19.23331	143.963	20.21981	143.967
1.65	16.55087	148.453	17.40015	148.458	18.29292	148.462	19.23142	148.465	20.21804	148.469
1.7	16.54885	152.958	17.39822	152.962	18.29109	152.965	19.22968	152.969	20.21639	152.972
1.75	16.54702	157.463	17.39650	157.466	18.28942	157.470	19.22813	157.473	20.21490	157.475
1.8	16.54550	161.969	17.38504	161.972	18.28805	161.975	19.22681	161.977	20.21365	161.979
1.85	16.54428	166.476	17.39386	166.478	18.28694	166.481	19.22577	166.482	20.21268	166.484
1.9	16.54337	170.984	17.39300	170.985	18.28611	170.987	19.22496	170.988	20.21189	170.989
1.95	16.54281	175.492	17.39248	175.493	18.28560	175.493	19.22448	175.494	20.21140	175.494
2.0	16.54263	180.000	17.39230	180.000	18.28546	180.000	19.22434	180.000	20.21129	180.000

Example. $\sinh (3.65 + i\,\underline{0.25}) = 19.22813\ \underline{/22°.527} = 19.22813\ \underline{/22°.31'.37''}$.

	x = 3.75		x = 3.8		x = 3.85		x = 3.9		x = 3.95	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	21.24878	0.000	22.33941	0.000	23.48589	0.000	24.69110	0.000	25.95806	0.000
0.05	21.24891	4.505	22.33952	4.504	23.48601	4.504	24.69120	4.504	25.95820	4.503
0.1	21.24935	9.010	22.33995	9.009	23.48640	9.008	24.69159	9.007	25.95854	9.007
0.15	21.25006	13.514	22.34061	13.513	23.48704	13.512	24.69223	13.511	25.95911	13.510
0.2	21.25102	18.019	22.34153	18.017	23.48791	18.015	24.69302	18.014	25.95991	18.013
0.25	21.25221	22.522	22.34270	22.520	23.48900	22.518	24.69406	22.517	25.96090	22.515
0.3	21.25362	27.026	22.34401	27.023	23.49028	27.021	24.69528	27.019	25.96205	27.017
0.35	21.25520	31.528	22.34550	31.526	23.49115	31.523	24.69662	31.521	25.96333	31.519
0.4	21.25685	36.030	22.34712	36.027	23.49322	36.025	24.69809	36.022	25.96471	36.020
0.45	21.25869	40.531	22.34883	40.528	23.49486	40.526	24.69964	40.523	25.96618	40.521
0.5	21.26052	45.032	22.35060	45.029	23.49652	45.026	24.70121	45.023	25.96770	45.021
0.55	21.26236	49.531	22.35230	49.528	23.49820	49.526	24.70280	49.523	25.96920	49.521
0.6	21.26415	54.030	22.35403	54.027	23.49980	54.025	24.70440	54.022	25.97066	54.020
0.65	21.26586	58.528	22.35565	58.526	23.50136	58.523	24.70580	58.521	25.97206	58.519
0.7	21.26745	63.026	22.35716	63.023	23.50277	63.021	24.70720	63.019	25.97337	63.017
0.75	21.26885	67.522	22.35850	67.520	23.50404	67.518	24.70840	67.517	25.97450	67.515
0.8	21.27000	72.019	22.35962	72.017	23.50512	72.015	24.70940	72.014	25.97550	72.013
0.85	21.27100	76.514	22.36055	76.513	23.50600	76.512	24.71024	76.511	25.97630	76.510
0.9	21.27170	81.010	22.36122	81.009	23.50664	81.008	24.71090	81.007	25.97680	81.007
0.95	21.27212	85.505	22.36163	85.504	23.50702	85.504	24.71120	85.504	25.97720	85.503
1.0	21.27230	90.000	22.36178	90.000	23.50717	90.000	24.71135	90.000	25.97731	90.000
1.05	21.27212	94.495	22.36163	94.496	23.50702	94.496	24.71120	94.496	25.97720	94.497
1.1	21.27170	98.990	22.36122	98.991	23.50664	98.992	24.71090	98.993	25.97680	98.993
1.15	21.27100	103.486	22.36055	103.487	23.50600	103.488	24.71024	103.489	25.97630	103.490
1.2	21.27000	107.981	22.35962	107.983	23.50512	107.985	24.70940	107.986	25.97550	107.987
1.25	21.26885	112.478	22.35850	112.480	23.50404	112.482	24.70840	112.483	25.97450	112.485
1.3	21.26745	116.974	22.35716	116.977	23.50277	116.979	24.70720	116.981	25.97337	116.983
1.35	21.26586	121.472	22.35565	121.474	23.50136	121.477	24.70580	121.479	25.97206	121.481
1.4	21.26415	125.970	22.35403	125.973	23.49980	125.975	24.70440	125.978	25.97066	125.980
1.45	21.26236	130.469	22.35230	130.472	23.49820	130.474	24.70280	130.477	25.96920	130.479
1.5	21.26052	134.968	22.35060	134.971	23.49652	134.974	24.70121	134.976	25.96770	134.979
1.55	21.25869	139.469	22.34883	139.472	23.49486	139.474	24.69964	139.477	25.96618	139.479
1.6	21.25685	143.970	22.34712	143.973	23.49322	143.975	24.69809	143.978	25.96471	143.980
1.65	21.25520	148.472	22.34550	148.474	23.49115	148.477	24.69662	148.479	25.96333	148.481
1.7	21.25362	152.974	22.34401	152.977	23.49028	152.979	24.69528	152.981	25.96205	152.983
1.75	21.25221	157.478	22.34270	157.480	23.48900	157.482	24.69406	157.483	25.96090	157.485
1.8	21.25102	161.981	22.34153	161.983	23.48791	161.985	24.69302	161.986	25.95991	161.987
1.85	21.25006	166.486	22.34061	166.487	23.48704	166.488	24.69223	166.489	25.95911	166.490
1.9	21.24935	170.990	22.33995	170.991	23.48640	170.992	24.69159	170.993	25.95854	170.993
1.95	21.24891	175.495	22.33952	175.496	23.48601	175.496	24.69120	175.496	25.95820	175.497
2.0	21.24878	180.000	22.33941	180.000	23.48589	180.000	24.69110	180.000	25.95806	180.000

Example. sinh $(3.90 + i\,\underline{1.90}) = 24.69159\ \underline{/170°.993} = 24.69159\ \underline{/170°.59'.35''}$.

Table XI. HYPERBOLIC COSINES. $\cosh(x + iq) = r \underline{/\gamma}$

	$x = 0.0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	1.00000	0.00	1.00125	0.00	1.00500	0.00	1.01127	0.00	1.02007	0.00
0.05	0.99692	0.00	0.99817	0.225	1.00194	0.450	1.00822	0.671	1.01704	0.890
0.1	0.98769	0.00	0.98895	0.453	0.99275	0.905	0.99909	1.351	1.00800	1.791
0.15	0.97237	0.00	0.97366	0.687	0.97752	1.371	0.98396	2.047	0.99300	2.713
0.2	0.95106	0.00	0.95237	0.930	0.95632	1.855	0.96290	2.769	0.97213	3.669
0.25	0.92388	0.00	0.92523	1.186	0.92930	2.364	0.93607	3.529	0.94556	4.674
0.3	0.89101	0.00	0.89237	1.458	0.89662	2.907	0.90364	4.338	0.91347	5.743
0.35	0.85264	0.00	0.85407	1.754	0.85851	3.495	0.86583	5.213	0.87609	6.897
0.4	0.80902	0.00	0.81053	2.079	0.81520	4.142	0.82291	6.174	0.83370	8.161
0.45	0.76041	0.00	0.76202	2.443	0.76698	4.866	0.77527	7.247	0.78661	9.569
0.5	0.70711	0.00	0.70803	2.860	0.71417	5.692	0.72296	8.468	0.73521	11.165
0.55	0.64945	0.00	0.65135	3.348	0.65713	6.656	0.66667	9.889	0.67994	13.012
0.6	0.58779	0.00	0.58989	3.934	0.59626	7.811	0.60676	11.581	0.62131	15.198
0.65	0.52250	0.00	0.52487	4.661	0.53201	9.238	0.54376	13.656	0.55995	17.853
0.7	0.45399	0.00	0.45672	5.600	0.46491	11.068	0.47831	16.289	0.49663	21.175
0.75	0.38268	0.00	0.38594	6.877	0.39558	13.529	0.41124	19.771	0.43242	25.478
0.8	0.30902	0.00	0.31304	8.741	0.32485	17.053	0.34375	24.618	0.36882	31.277
0.85	0.23345	0.00	0.23874	11.755	0.25403	22.545	0.27779	31.805	0.30827	39.424
0.9	0.15643	0.00	0.16424	17.507	0.18576	32.181	0.21712	43.229	0.25497	51.254
0.95	0.07846	0.00	0.09305	32.407	0.12724	51.700	0.16978	62.139	0.21608	68.261
1.0	0.00	180	0.05002	90.000	0.10017	90.000	0.15056	90.000	0.20134	90.000
1.05	0.07846	180	0.09305	147.593	0.12724	128.300	0.16978	117.861	0.21608	111.739
1.1	0.15643	180	0.16424	162.493	0.18576	147.819	0.21712	136.771	0.25497	128.746
1.15	0.23345	180	0.23874	168.245	0.25403	157.455	0.27779	148.195	0.30827	140.576
1.2	0.30902	180	0.31304	171.259	0.32485	162.947	0.34375	155.382	0.36882	148.723
1.25	0.38268	180	0.38594	173.123	0.39558	166.471	0.41124	160.229	0.43242	154.522
1.3	0.45399	180	0.45672	174.400	0.46491	168.932	0.47831	163.711	0.49663	158.825
1.35	0.52250	180	0.52487	175.339	0.53201	170.762	0.54376	166.344	0.55995	162.147
1.4	0.58779	180	0.58989	176.066	0.59626	172.189	0.60676	168.419	0.62131	164.802
1.45	0.64945	180	0.65135	176.652	0.65713	173.344	0.66667	170.111	0.67994	166.988
1.5	0.70711	180	0.70803	177.139	0.71417	174.308	0.72296	171.532	0.73521	168.835
1.55	0.76041	180	0.76202	177.557	0.76698	175.134	0.77527	172.753	0.78661	170.431
1.6	0.80902	180	0.81053	177.921	0.81520	175.858	0.82291	173.826	0.83370	171.839
1.65	0.85264	180	0.85407	178.246	0.85851	176.505	0.86583	174.787	0.87609	173.103
1.7	0.89101	180	0.89237	178.542	0.89662	177.093	0.90364	175.662	0.91347	174.257
1.75	0.92388	180	0.92523	178.814	0.92930	177.636	0.93607	176.471	0.94556	175.326
1.8	0.95106	180	0.95237	179.070	0.95632	178.145	0.96290	177.231	0.97213	176.331
1.85	0.97237	180	0.97366	179.313	0.97752	178.629	0.98396	177.953	0.99300	177.287
1.9	0.98769	180	0.98895	179.547	0.99275	179.095	0.99909	178.649	1.00800	178.209
1.95	0.99692	180	0.99817	179.775	1.00194	179.550	1.00822	179.329	1.01704	179.110
2.0	1.00000	180	1.00125	180.000	1.00500	180.000	1.01127	180.000	1.02007	180.000

Example. $\cosh(0.10 + i\,\underline{0.55}) = 0.65713\ \underline{/6^\circ.656} = 0.65713\ \underline{/6^\circ.39'.22''}.$

Table XI. HYPERBOLIC COSINES. cosh $(x + iq) = r \underline{/\gamma}$. Continued

	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	1.03141	0.000	1.04534	0.000	1.06188	0.000	1.08107	0.000	1.10297	0.000
0.05	1.02843	1.104	1.04239	1.313	1.05898	1.516	1.07822	1.713	1.10017	1.902
0.1	1.01949	2.221	1.03357	2.642	1.05029	3.050	1.06970	3.444	1.09182	3.823
0.15	1.00464	3.365	1.01894	4.001	1.03590	4.617	1.05557	5.212	1.07798	5.784
0.2	0.98403	4.550	0.99862	5.407	1.01592	6.238	1.03597	7.038	1.05880	7.806
0.25	0.95779	5.793	0.97277	6.881	0.99052	7.932	1.01107	8.944	1.03446	9.913
0.3	0.92612	7.113	0.94161	8.443	0.95994	9.726	0.98113	10.957	1.00521	12.132
0.35	0.88927	8.536	0.90539	10.122	0.92444	11.647	0.94642	13.107	0.97136	14.496
0.4	0.84754	10.090	0.86443	11.951	0.88436	13.733	0.90732	15.432	0.93330	17.042
0.45	0.80127	11.815	0.81912	13.972	0.84012	16.029	0.86426	17.979	0.89149	19.816
0.5	0.75088	13.762	0.76989	16.241	0.79220	18.592	0.81775	20.804	0.84469	22.875
0.55	0.69685	16.001	0.71730	18.834	0.74119	21.497	0.76844	23.982	0.79895	26.288
0.6	0.63977	18.629	0.66199	21.849	0.68781	24.843	0.71708	27.607	0.74969	30.144
0.65	0.58036	21.785	0.60476	25.425	0.63292	28.763	0.66462	31.800	0.69968	34.546
0.7	0.51954	25.673	0.54666	29.758	0.57766	33.157	0.61223	36.712	0.65012	39.626
0.75	0.45854	30.595	0.48906	35.118	0.52348	39.079	0.56140	42.529	0.60249	45.527
0.8	0.39913	37.008	0.43385	41.878	0.47231	45.992	0.51401	49.464	0.55860	52.399
0.85	0.34396	45.057	0.38370	50.507	0.42671	54.484	0.47246	57.712	0.52062	60.358
0.9	0.29782	57.110	0.34235	61.467	0.38994	64.786	0.43953	67.371	0.49093	69.424
0.95	0.26452	72.186	0.31447	74.882	0.36571	76.831	0.41818	78.297	0.47191	79.433
1.0	0.25261	90.000	0.30452	90.000	0.35719	90.000	0.41075	90.000	0.46534	90.000
1.05	0.26452	107.814	0.31447	105.118	0.36571	103.169	0.41818	101.703	0.47191	100.567
1.1	0.29782	122.890	0.34235	118.533	0.38994	115.214	0.43953	112.629	0.49093	110.576
1.15	0.34396	134.943	0.38370	129.493	0.42671	125.516	0.47246	122.288	0.52062	119.642
1.2	0.39913	142.992	0.43385	138.122	0.47231	134.008	0.51401	130.536	0.55860	127.601
1.25	0.45854	149.405	0.48906	144.882	0.52348	140.921	0.56140	137.471	0.60249	134.473
1.3	0.51954	154.327	0.54666	150.242	0.57766	146.843	0.61223	143.288	0.65012	140.374
1.35	0.58036	158.215	0.60476	154.575	0.63292	151.237	0.66462	148.200	0.69968	145.454
1.4	0.63977	161.371	0.66199	158.151	0.68781	155.157	0.71708	152.393	0.74969	149.856
1.45	0.69685	163.999	0.71730	161.166	0.74119	158.503	0.76844	156.018	0.79895	153.712
1.5	0.75088	166.238	0.76989	163.759	0.79220	161.408	0.81775	159.196	0.84649	157.125
1.55	0.80127	168.185	0.81912	166.028	0.84012	163.971	0.86426	162.021	0.89149	160.184
1.6	0.84754	169.910	0.86443	168.049	0.88436	166.267	0.90732	164.568	0.93330	162.958
1.65	0.88927	171.464	0.90539	169.878	0.92444	168.353	0.94642	166.893	0.97136	165.504
1.7	0.92612	172.887	0.94161	171.557	0.95994	170.274	0.98113	169.043	1.00521	167.868
1.75	0.95779	174.207	0.97277	173.119	0.99052	172.068	1.01107	171.056	1.03446	170.087
1.8	0.98403	175.450	0.99862	174.593	1.01592	173.762	1.03597	172.962	1.05880	172.194
1.85	1.00464	176.635	1.01894	175.999	1.03590	175.383	1.05557	174.788	1.07798	174.216
1.9	1.01949	177.779	1.03357	177.358	1.05029	176.950	1.06970	176.556	1.09182	176.177
1.95	1.02843	178.896	1.04239	178.687	1.05898	178.484	1.07822	178.287	1.10017	178.098
2.0	1.03141	180.000	1.04534	180.000	1.06188	180.000	1.08107	180.000	1.10297	180.000

Example. cosh $(0.40 + i\,\underline{0.5}) = 0.81775\ \underline{/20°.804} = 0.81775\ \underline{/20°.48'.14''}$.

Table XI. HYPERBOLIC COSINES. $\cosh(x + iq) = r \underline{/\gamma}$. Continued

	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	1.12763	0.000	1.15510	0.000	1.18547	0.000	1.21879	0.000	1.25517	0.000
0.05	1.12489	2.083	1.15244	2.256	1.18287	2.420	1.21626	2.576	1.25271	2.723
0.1	1.11672	4.186	1.14446	4.533	1.17510	4.879	1.20871	5.174	1.24538	5.468
0.15	1.10320	6.331	1.13127	6.852	1.16226	7.347	1.19623	7.815	1.23327	8.256
0.2	1.08446	8.539	1.11300	9.237	1.14448	9.898	1.17892	10.523	1.21653	11.110
0.25	1.06070	10.836	1.08987	11.713	1.12200	12.541	1.15715	13.322	1.19541	14.054
0.3	1.03220	13.249	1.06214	14.307	1.09509	15.304	1.13108	16.240	1.17019	17.116
0.35	0.99927	15.811	1.03004	17.052	1.06411	18.216	1.10111	19.306	1.14125	20.323
0.4	0.96232	18.559	0.99437	19.984	1.02948	21.315	1.06769	22.555	1.10904	23.706
0.45	0.92182	21.538	0.95524	23.146	0.99174	24.640	1.03134	26.024	1.07409	27.302
0.5	0.87837	24.803	0.91338	26.589	0.95149	28.238	0.99270	29.755	1.03704	31.148
0.55	0.83266	28.416	0.86951	30.372	0.90946	32.162	0.95249	33.796	0.99861	35.284
0.6	0.78552	32.458	0.82447	34.563	0.86650	36.471	0.91156	38.197	0.95966	39.755
0.65	0.73793	37.020	0.77927	39.241	0.82361	41.231	0.87090	43.011	0.92112	44.603
0.7	0.69112	42.207	0.73510	44.489	0.78194	46.506	0.83160	48.290	0.88406	49.867
0.75	0.64652	48.129	0.69333	50.390	0.74282	52.358	0.79492	54.074	0.84965	55.574
0.8	0.60583	54.889	0.65555	57.010	0.70769	58.826	0.76220	60.387	0.81911	61.737
0.85	0.57100	62.547	0.62350	64.375	0.67810	65.914	0.73482	67.219	0.79369	68.335
0.9	0.54407	71.082	0.59894	72.441	0.65559	73.568	0.71409	74.514	0.77455	75.315
0.95	0.52697	80.335	0.58345	81.064	0.64147	81.663	0.70115	82.161	0.76263	82.581
1.0	0.52110	90.000	0.57815	90.000	0.63665	90.000	0.69675	90.000	0.75858	90.000
1.05	0.52697	99.665	0.58345	98.936	0.64147	98.337	0.70115	97.839	0.76263	97.419
1.1	0.54407	108.918	0.59894	107.559	0.65559	106.432	0.71409	105.486	0.77455	104.685
1.15	0.57100	117.453	0.62350	115.625	0.67810	114.086	0.73482	112.781	0.79369	111.665
1.2	0.60583	125.111	0.65555	122.990	0.70769	121.174	0.76220	119.613	0.81911	118.263
1.25	0.64652	131.871	0.69333	129.610	0.74282	127.642	0.79492	125.926	0.84965	124.426
1.3	0.69112	137.793	0.73510	135.511	0.78194	133.494	0.83160	131.710	0.88406	130.133
1.35	0.73793	142.980	0.77927	140.759	0.82361	138.769	0.87090	136.989	0.92112	135.397
1.4	0.78552	147.542	0.82447	145.437	0.86650	143.529	0.91156	141.803	0.95966	140.245
1.45	0.83266	151.584	0.86951	149.628	0.90946	147.838	0.95249	146.204	0.99861	144.716
1.50	0.87837	155.198	0.91338	153.411	0.95149	151.762	0.99270	150.245	1.03704	148.853
1.55	0.92182	158.462	0.95524	156.854	0.99174	155.360	1.03134	153.976	1.07409	152.698
1.60	0.96232	161.441	0.99437	160.016	1.02948	158.685	1.06769	157.445	1.10904	156.294
1.65	0.99927	164.189	1.03004	162.948	1.06411	161.784	1.10111	160.694	1.14125	159.677
1.70	1.03220	166.751	1.06214	165.693	1.09509	164.696	1.13108	163.760	1.17019	162.884
1.75	1.06070	169.164	1.08987	168.287	1.12200	167.459	1.15715	166.678	1.19541	165.946
1.8	1.08446	171.461	1.11300	170.763	1.14448	170.102	1.17892	169.477	1.21653	168.890
1.85	1.10320	173.669	1.13127	173.148	1.16226	172.653	1.19623	172.185	1.23327	171.744
1.9	1.11672	175.814	1.14446	175.467	1.17510	175.121	1.20871	174.826	1.24538	174.532
1.95	1.12489	177.917	1.15244	177.744	1.18287	177.580	1.21626	177.424	1.25271	177.277
2.0	1.12763	180.000	1.15510	180.000	1.18547	180.000	1.21879	180.000	1.25517	180.000

Example. $\cosh(0.65 + i\,\underline{1.0}) = 0.69675 \underline{/90°}$.

	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	1.29468	0.000	1.33743	0.000	1.38353	0.000	1.43309	0.000	1.48623	0.000
0.05	1.29230	2.862	1.33513	2.992	1.38130	3.113	1.43094	3.227	1.48415	3.332
0.1	1.28520	5.745	1.32825	6.004	1.37466	6.246	1.42452	6.473	1.47797	6.684
0.15	1.27346	8.670	1.31691	9.058	1.36369	9.420	1.41395	9.758	1.46778	10.071
0.2	1.25726	11.661	1.30124	12.175	1.34858	12.656	1.39937	13.102	1.45371	13.516
0.25	1.23689	14.740	1.28152	15.379	1.32955	15.974	1.38105	16.526	1.43611	17.037
0.3	1.21248	17.933	1.25802	18.693	1.30693	19.398	1.35927	20.051	1.41519	20.653
0.35	1.18457	21.267	1.23115	22.143	1.28107	22.952	1.33444	23.699	1.39136	24.387
0.4	1.15356	24.772	1.20135	25.755	1.25246	26.601	1.30700	27.493	1.36505	28.257
0.45	1.12001	28.478	1.16917	29.559	1.22163	30.550	1.27748	31.457	1.33682	32.286
0.5	1.08453	32.442	1.13522	33.586	1.18918	34.647	1.24649	35.614	1.30723	36.493
0.55	1.04785	36.637	1.10024	37.865	1.15583	38.978	1.21471	39.986	1.27697	40.898
0.6	1.01079	41.160	1.06500	42.426	1.12234	43.567	1.18289	44.593	1.24674	45.517
0.65	0.97427	46.026	1.03041	47.298	1.08957	48.435	1.15184	49.453	1.21732	50.363
0.7	0.93932	51.263	0.99742	52.500	1.05843	53.599	1.12243	54.574	1.19227	55.443
0.75	0.90700	56.889	0.96705	58.045	1.02985	59.062	1.09553	59.961	1.16418	60.755
0.8	0.87846	62.907	0.94033	63.927	1.00481	64.819	1.07202	65.601	1.14209	66.288
0.85	0.85481	69.294	0.91828	70.123	0.98420	70.842	1.05273	71.471	1.12400	72.020
0.9	0.83706	75.998	0.90178	76.585	0.96883	77.091	1.03837	77.532	1.11056	77.915
0.95	0.82605	82.936	0.89157	83.241	0.95933	83.503	1.02951	83.730	1.10227	83.927
1.0	0.82232	90.000	0.88811	90.000	0.95612	90.000	1.02652	90 000	1.09948	90.000
1.05	0.82605	97.064	0.89157	96.759	0.95933	96.497	1.02951	96.270	1.10227	96.073
1.1	0.83706	104.002	0.90178	103.415	0.96883	102.909	1.03837	102.468	1.11056	102.085
1.15	0.85481	110.706	0.91828	109.877	0.98420	109.158	1.05273	108.529	1 12400	107.980
1.2	0.87846	117.093	0.94033	116.073	1.00481	115.181	1.07202	114.399	1.14209	113.712
1.25	0.90700	123.111	0.96705	121.955	1.02985	120.938	1.09553	120.039	1.16418	119.245
1.3	0.93932	128.737	0.99742	127.500	1.05843	126.401	1.12243	125.426	1.19227	124.557
1.35	0.97427	133.974	1.03041	132.702	1.08957	131.565	1.15184	130.547	1.21732	129.637
1.4	1.01079	138.840	1.06500	137.574	1.12234	136.433	1.18289	135.407	1.24674	134.483
1.45	1.04785	143.363	1.10024	142.135	1.15583	141.022	1.21471	140.014	1.27697	139.102
1.5	1.08453	147.578	1.13522	146.414	1.18918	145.353	1.24649	144.386	1.30723	143.507
1.55	1.12001	151.522	1.16917	150.441	1.22163	149.450	1.27748	148.543	1.33682	147.714
1.6	1.15356	155.228	1.20135	154.245	1.25246	153.399	1.30700	152.507	1.36505	151.743
1.65	1.18457	158.733	1.23115	157.857	1.28107	157.048	1.33444	156.301	1.39136	155.613
1.7	1.21248	162.067	1.25802	161.307	1.30693	160.602	1.35927	159.949	1.41519	159.347
1.75	1.23689	165.260	1.28152	164.621	1.32955	164.026	1.38105	163.474	1.43611	162.963
1.8	1.25726	168.339	1.30124	167.825	1.34858	167.344	1.39937	166.898	1.45371	166.484
1.85	1.27346	171.330	1.31691	170.942	1.36369	170.580	1.41395	170.242	1.46778	169.929
1.9	1.28520	174.255	1.32825	173.996	1.37466	173.754	1.42452	173.527	1.47797	173.316
1.95	1.29230	177.138	1.33513	177.008	1.38130	176.887	1.43094	176.773	1.48415	176.668
2.0	1.29468	180.000	1.33743	180.000	1.38353	180.000	1.43309	180.000	1.48623	180.000

Example. $\cosh(0.90 + i\,\underline{0.5}) = 1.24649\ \underline{/35^\circ.614} = 1.24649\ \underline{/35^\circ.36'.50''}.$

Table XI. HYPERBOLIC COSINES. cosh $(x + iq) = r \angle\gamma$. Continued

	$x = 1.0$		$x = 1.05$		$x = 1.1$		$x = 1.15$		$x = 1.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	1.54308	0.000	1.60379	0.000	1.66852	0.000	1.73741	0.000	1.81066	0.000
0.05	1.54108	3.276	1.60187	3.521	1.66667	3.605	1.73564	3.683	1.80895	3.754
0.1	1.53513	6.878	1.59614	7.059	1.66117	7.226	1.73036	7.380	1.80389	7.522
0.15	1.52532	10.362	1.58671	10.631	1.65211	10.879	1.72166	11.107	1.79555	11.318
0.2	1.51182	13.899	1.57374	14.253	1.63965	14.579	1.70971	14.880	1.78409	15.156
0.25	1.49487	17.509	1.55747	17.944	1.62404	18.344	1.69472	18.713	1.76975	19.050
0.3	1.47479	21.209	1.53820	21.720	1.60558	22.189	1.67705	22.620	1.75282	23.014
0.35	1.45193	25.019	1.51630	25.599	1.58460	26.130	1.65699	26.616	1.73363	27.061
0.4	1.42675	28.957	1.49220	29.597	1.56156	30.182	1.63497	30.716	1.71260	31.203
0.45	1.39976	33.043	1.46641	33.732	1.53694	34.360	1.61147	34.931	1.69018	35.451
0.5	1.37153	37.293	1.43950	38.019	1.51128	38.677	1.58701	39.275	1.66688	39.816
0.55	1.34272	41.724	1.41207	42.470	1.48517	43.145	1.56217	43.755	1.64325	44.307
0.6	1.31400	46.349	1.38479	47.098	1.45926	47.773	1.53756	48.380	1.61987	48.927
0.65	1.28612	51.179	1.35837	51.910	1.43421	52.565	1.51381	53.153	1.59733	53.681
0.7	1.25984	56.216	1.33351	56.907	1.41070	57.523	1.49155	58.074	1.57626	58.567
0.75	1.23594	61.459	1.31095	62.085	1.38939	62.641	1.47141	63.136	1.55721	63.579
0.8	1.21515	66.895	1.29137	67.432	1.37093	67.908	1.45399	68.330	1.54077	68.706
0.85	1.19816	72.504	1.27540	72.929	1.35590	73.306	1.43983	73.639	1.52741	73.935
0.9	1.18552	78.252	1.26358	78.547	1.34478	78.808	1.42936	79.039	1.51755	79.243
0.95	1.17782	84.100	1.25631	84.252	1.33795	84.385	1.42294	84.503	1.51150	84.607
1.0	1.17520	90.000	1.25386	90.000	1.33565	90.000	1.42078	90.000	1.50946	90.000
1.05	1.17782	95.900	1.25631	95.748	1.33795	95.615	1.42294	95.497	1.51150	95.393
1.1	1.18552	101.748	1.26358	101.453	1.34478	101.192	1.42936	100.961	1.51755	100.757
1.15	1.19816	107.496	1.27540	107.071	1.35590	106.694	1.43983	106.361	1.52741	106.065
1.2	1.21515	113.105	1.29137	112.568	1.37093	112.092	1.45399	111.670	1.54077	111.294
1.25	1.23594	118.541	1.31095	117.915	1.38939	117.359	1.47141	116.864	1.55721	116.421
1.3	1.25984	123.784	1.33351	123.093	1.41070	122.477	1.49155	121.926	1.57626	121.433
1.35	1.28612	128.821	1.35837	128.090	1.43421	127.435	1.51381	126.847	1.59733	126.319
1.4	1.31400	133.651	1.38479	132.902	1.45926	132.227	1.53756	131.620	1.61987	131.073
1.45	1.34272	138.276	1.41207	137.530	1.48517	136.855	1.56217	136.245	1.64325	135.693
1.5	1.37153	142.707	1.43950	141.981	1.51128	141.323	1.58701	140.725	1.66688	140.184
1.55	1.39976	146.957	1.46641	146.268	1.53694	145.640	1.61147	145.069	1.69018	144.549
1.6	1.42675	151.043	1.49220	150.403	1.56156	149.818	1.63497	149.284	1.71260	148.797
1.65	1.45193	154.981	1.51630	154.401	1.58460	153.870	1.65699	153.384	1.73363	152.939
1.7	1.47479	158.791	1.53820	158.280	1.60558	157.811	1.67705	157.380	1.75282	156.986
1.75	1.49487	162.491	1.55747	162.056	1.62404	161.656	1.69472	161.287	1.76975	160.950
1.8	1.51182	166.101	1.57374	165.747	1.63965	165.421	1.70971	165.120	1.78409	164.844
1.85	1.52532	169.638	1.58671	169.369	1.65211	169.121	1.72166	168.893	1.79555	168.682
1.9	1.53513	173.122	1.59614	172.941	1.66117	172.774	1.73036	172.620	1.80389	172.478
1.95	1.54108	176.724	1.60187	176.479	1.66667	176.395	1.73564	176.317	1.80895	176.246
2.0	1.54308	180.000	1.60379	180.000	1.66852	180.000	1.73741	180.000	1.81066	180.000

Example. cosh $(1.20 + i\,0) = 1.81066 \angle 0°$.

	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	1.88842	0.000	1.97091	0.000	2.05833	0.000	2.15090	0.000	2.24884	0.000
0.05	1.88679	3.820	1.96935	3.880	2.05684	3.935	2.14947	3.986	2.24747	4.032
0.1	1.88193	7.652	1.96470	7.772	2.05238	7.882	2.14520	7.982	2.24334	8.075
0.15	1.87394	11.511	1.95704	11.689	2.04505	11.851	2.13819	12.000	2.23669	12.136
0.2	1.86297	15.410	1.94654	15.642	2.03500	15.855	2.12858	16.049	2.22751	16.226
0.25	1.84924	19.360	1.93341	19.644	2.02245	19.903	2.11658	20.139	2.21604	20.355
0.3	1.83304	23.375	1.91792	23.705	2.00764	24.006	2.10244	24.281	2.20254	24.531
0.35	1.81470	27.467	1.90040	27.837	1.99091	28.175	2.08647	28.482	2.18731	28.762
0.4	1.79462	31.646	1.88123	32.050	1.97262	32.417	2.06903	32.751	2.17067	33.055
0.45	1.77323	35.923	1.86084	26.352	1.95319	36.742	2.05051	37.095	2.15302	37.416
0.5	1.75104	40.308	1.83970	40.752	1.93306	41.155	2.03135	41.520	2.13478	41.851
0.55	1.72856	44.805	1.81832	45.255	1.91273	45.662	2.01200	46.030	2.11637	46.362
0.6	1.70635	49.420	1.79722	49.865	1.89268	50.265	1.99295	50.627	2.09828	50.953
0.65	1.68497	54.155	1.77694	54.582	1.87343	54.965	1.97468	55.311	2.08093	55.621
0.7	1.66501	59.009	1.75802	59.405	1.85549	59.760	1.95767	60.079	2.06479	60.366
0.75	1.64699	63.974	1.74096	64.327	1.83934	64.644	1.94237	64.927	2.05030	65.182
0.8	1.63145	69.042	1.72627	69.341	1.82544	69.608	1.92921	69.847	2.03784	70.061
0.85	1.61884	74.197	1.71435	74.432	1.81417	74.641	1.91856	74.828	2.02775	74.995
0.9	1.60954	79.424	1.70557	79.585	1.80588	79.729	1.91072	79.857	2.02034	79.972
0.95	1.60384	84.699	1.70019	84.782	1.80080	84.855	1.90592	84.920	2.01580	84.979
1.0	1.60192	90.000	1.69838	90.000	1.79909	90.000	1.90430	90.000	2.01427	90.000
1.05	1.60384	95.301	1.70019	95.218	1.80080	95.145	1.90592	95.080	2.01580	95.021
1.1	1.60954	100.576	1.70557	100.415	1.80588	100.271	1.91072	100.143	2.02034	100.028
1.15	1.61884	105.803	1.71435	105.568	1.81417	105.359	1.91856	105.172	2.02775	105.005
1.2	1.63145	110.958	1.72627	110.659	1.82544	110.392	1.92921	110.153	2.03784	109.939
1.25	1.64699	116.026	1.74096	115.673	1.83934	115.356	1.94237	115.073	2.05030	114.818
1.3	1.66501	120.991	1.75802	120.595	1.85549	120.240	1.95767	119.921	2.06479	119.634
1.35	1.68497	125.845	1.77694	125.418	1.87343	125.035	1.97468	124.689	2.08093	124.379
1.4	1.70635	130.580	1.79722	130.135	1.89268	129.735	1.99295	129.373	2.09828	129.047
1.45	1.72856	135.195	1.81832	134.745	1.91273	134.338	2.01200	133.970	2.11637	133.638
1.5	1.75104	139.693	1.83970	139.248	1.93306	138.845	2.03135	138.480	2.13478	138.150
1.55	1.77323	144.077	1.86084	143.648	1.95319	143.258	2.05051	142.905	2.15302	142.584
1.6	1.79462	148.354	1.88123	147.950	1.97262	147.583	2.06903	147.249	2.17067	146.945
1.65	1.81470	152.533	1.90040	152.163	1.99091	151.825	2.08647	151.518	2.18731	151.238
1.7	1.83304	156.625	1.91792	156.295	2.00764	155.994	2.10244	155.719	2.20254	155.469
1.75	1.84924	160.640	1.93341	160.356	2.02245	160.097	2.11658	159.861	2.21604	159.645
1.8	1.86297	164.590	1.94654	164.358	2.03500	164.145	2.12858	163.951	2.22751	163.774
1.85	1.87394	168.489	1.95704	168.311	2.04505	168.149	2.13819	168.000	2.23669	167.864
1.9	1.88193	172.348	1.96470	172.228	2.05238	172.118	2.14520	172.018	2.24334	171.925
1.95	1.88679	176.180	1.96935	176.120	2.05684	176.065	2.14947	176.014	2.24747	175.968
2.0	1.88842	180.000	1.97091	180.000	2.05833	180.000	2.15090	180.000	2.24884	180.000

Example. $\cosh (1.35 + i\,\underline{1.30}) = 1.85549 \underline{/120^\circ.240} = 1.85549 \underline{/120^\circ.14'.24''}$.

	x = 1.5		x = 1.55		x = 1.6		x = 1.65		x = 1.7	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	2.35241	0.000	2.46186	0.000	2.57746	0.000	2.69952	0.000	2.82832	0.000
0.05	2.35110	4.075	2.46061	4.113	2.57627	4.149	2.69839	4.181	2.82723	4.210
0.1	2.34720	8.158	2.45688	8.235	2.57272	8.305	2.69499	8.369	2.82399	8.427
0.15	2.34080	12.260	2.45076	12.374	2.56687	12.477	2.68941	12.571	2.81867	12.657
0.2	2.33202	16.389	2.44238	16.536	2.55887	16.671	2.68178	16.794	2.81138	16.906
0.25	2.32107	20.552	2.43193	20.732	2.54890	20.895	2.67226	21.044	2.80230	21.179
0.3	2.30819	24.759	2.41976	24.967	2.53717	25.155	2.66108	25.327	2.79164	25.483
0.35	2.29365	29.016	2.40577	29.248	2.52395	29.458	2.64847	29.649	2.77963	29.822
0.4	2.27779	33.330	2.39066	33.580	2.50955	33.808	2.63476	34.014	2.76657	34.201
0.45	2.26098	37.706	2.37465	37.970	2.49430	38.209	2.62024	38.426	2.75274	38.622
0.5	2.24362	42.150	2.35812	42.421	2.47857	42.666	2.60527	42.887	2.73850	43.089
0.55	2.22612	46.663	2.34148	46.934	2.46274	47.180	2.59021	47.401	2.72418	47.602
0.6	2.20892	51.247	2.32513	51.512	2.44721	51.752	2.57544	51.968	2.71014	52.163
0.65	2.19245	55.901	2.30949	56.154	2.43235	56.381	2.56133	56.585	2.69673	56.771
0.7	2.17714	60.624	2.29496	60.856	2.41856	61.065	2.54824	61.253	2.68430	61.422
0.75	2.16340	65.410	2.28193	65.615	2.40619	65.800	2.53650	65.966	2.67316	66.116
0.8	2.15159	70.254	2.27074	70.426	2.39558	70.581	2.52644	70.720	2.66361	70.845
0.85	2.14204	75.145	2.26169	75.279	2.38701	75.400	2.51831	75.508	2.65591	75.605
0.9	2.13502	80.075	2.25504	80.167	2.38071	80.249	2.51234	80.323	2.65025	80.390
0.95	2.13073	85.031	2.25098	85.077	2.37686	85.119	2.50869	85.157	2.64679	85.191
1.0	2.12928	90.000	2.24961	90.000	2.37557	90.000	2.50747	90.000	2.64563	90.000
1.05	2.13073	94.969	2.25098	94.923	2.37686	94.881	2.50869	94.843	2.64679	94.809
1.1	2.13502	99.925	2.25504	99.833	2.38071	99.751	2.51234	99.677	2.65025	99.610
1.15	2.14204	104.855	2.26169	104.721	2.38701	104.600	2.51831	104.492	2.65591	104.395
1.2	2.15159	109.746	2.27074	109.574	2.39558	109.419	2.52644	109.280	2.66361	109.155
1.25	2.16340	114.590	2.28193	114.385	2.40619	114.200	2.53650	114.034	2.67316	113.884
1.3	2.17714	119.376	2.29496	119.144	2.41856	118.935	2.54824	118.747	2.68430	118.578
1.35	2.19245	124.099	2.30949	123.846	2.43235	123.619	2.56133	123.415	2.69673	123.229
1.4	2.20892	128.753	2.32513	128.488	2.44721	128.248	2.57544	128.032	2.71014	127.837
1.45	2.22612	133.337	2.34148	133.066	2.46274	132.820	2.59021	132.599	2.72418	132.398
1.5	2.24362	137.850	2.35812	137.580	2.47857	137.334	2.60527	137.113	2.73850	136.911
1.55	2.26098	142.294	2.37465	142.030	2.49430	141.791	2.62024	141.574	2.75274	141.378
1.6	2.27779	146.670	2.39066	146.420	2.50955	146.192	2.63476	145.986	2.76657	145.799
1.65	2.29365	150.984	2.40577	150.752	2.52395	150.542	2.64847	150.351	2.77963	150.178
1.7	2.30819	155.241	2.41976	155.033	2.53717	154.845	2.66108	154.673	2.79164	154.517
1.75	2.32107	159.448	2.43193	159.268	2.54890	159.105	2.67226	158.956	2.80230	158.821
1.8	2.33202	163.611	2.44238	163.464	2.55887	163.329	2.68178	163.206	2.81138	163.094
1.85	2.34080	167.740	2.45076	167.626	2.56687	167.523	2.68941	167.429	2.81867	167.343
1.9	2.34720	171.842	2.45688	171.765	2.57272	171.695	2.69499	171.631	2.82399	171.573
1.95	2.35110	175.925	2.46061	175.887	2.57627	175.851	2.69839	175.819	2.82723	175.790
2.0	2.35241	180.000	2.46186	180.000	2.57746	180.000	2.69952	180.000	2.82832	180.000

Example. $\cosh(1.6 + i\,\underline{1.6}) = 2.50955\,\underline{/146^\circ.192} = 2.50955\,\underline{/146^\circ.11'.31''}$.

	$x = 1.75$		$x = 1.8$		$x = 1.85$		$x = 1.9$		$x = 1.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	2.96419	0.000	3.10747	0.000	3.25853	0.000	3.41773	0.000	3.58548	0.000
0.05	2.96315	4.237	3.10648	4.262	3.25759	4.284	3.41683	4.304	3.58462	4.322
0.1	2.96006	8.480	3.10353	8.529	3.25477	8.572	3.41415	8.612	3.58207	8.648
0.15	2.95498	12.735	3.09869	12.806	3.25015	12.871	3.40975	12.929	3.57788	12.983
0.2	2.94804	17.008	3.09206	17.100	3.24384	17.184	3.40373	17.260	3.57213	17.330
0.25	2.93938	21.302	3.08382	21.414	3.23598	21.516	3.39624	21.608	3.56500	21.692
0.3	2.92921	25.625	3.07413	25.754	3.22675	25.871	3.38745	25.977	3.55663	26.073
0.35	2.91777	29.980	3.06323	30.123	3.21636	30.252	3.37756	30.369	3.54721	30.476
0.4	2.90532	34.370	3.05138	34.524	3.20507	34.663	3.36681	34.789	3.53698	34.904
0.45	2.89217	38.800	3.03885	38.961	3.19315	39.107	3.35546	39.239	3.52617	39.358
0.5	2.87861	43.270	3.02595	43.435	3.18088	43.584	3.34378	43.719	3.51507	43.840
0.55	2.86499	47.784	3.01300	47.947	3.16856	48.096	3.33207	48.230	3.50393	48.351
0.6	2.85165	52.339	3.00031	52.499	3.15650	52.643	3.32060	52.773	3.49302	52.890
0.65	2.83891	56.937	2.98821	57.088	3.14500	57.224	3.30967	57.346	3.48263	57.457
0.7	2.82710	61.575	2.97699	61.713	3.13434	61.837	3.29955	61.949	3.47301	62.050
0.75	2.81653	66.250	2.96695	66.371	3.12481	66.480	3.29049	66.579	3.46441	66.668
0.8	2.80747	70.958	2.95835	71.059	3.11665	71.150	3.28274	71.233	3.45702	71.307
0.85	2.80016	75.693	2.95142	75.772	3.11006	75.842	3.27649	75.906	3.45112	75.964
0.9	2.79479	80.449	2.94633	80.503	3.10523	80.552	3.27191	80.595	3.44675	80.635
0.95	2.79151	85.221	2.94322	85.248	3.10228	85.273	3.26911	85.295	3.44410	85.315
1.0	2.79041	90.000	2.94217	90.000	3.10129	90.000	3.26816	90.000	3.44321	90.000
1.05	2.79151	94.779	2.94322	94.752	3.10228	94.727	3.26911	94.705	3.44410	94.685
1.1	2.79479	99.551	2.94633	99.497	3.10523	99.448	3.27191	99.405	3.44675	99.365
1.15	2.80016	104.307	2.95142	104.228	3.11006	104.158	3.27649	104.094	3.45112	104.036
1.2	2.80747	109.042	2.95835	108.941	3.11665	108.850	3.28274	108.767	3.45702	108.693
1.25	2.81653	113.750	2.96695	113.629	3.12481	113.520	3.29049	113.421	3.46441	113.332
1.3	2.82710	118.425	2.97699	118.287	3.13434	118.163	3.29955	118.051	3.47301	117.950
1.35	2.83891	123.063	2.98821	122.912	3.14500	122.776	3.30967	122.654	3.48263	122.543
1.4	2.85165	127.661	3.00031	127.501	3.15650	127.357	3.32060	127.227	3.49302	127.110
1.45	2.86499	132.216	3.01300	132.053	3.16856	131.904	3.33207	131.770	3.50393	131.649
1.5	2.87861	136.730	3.02595	136.565	3.18088	136.416	3.34378	136.281	3.51507	136.160
1.55	2.89217	141.200	3.03885	141.039	3.19315	140.893	3.35546	140.761	3.52617	140.642
1.6	2.90532	145.630	3.05138	145.476	3.20507	145.337	3.36681	145.211	3.53698	145.096
1.65	2.91777	150.020	3.06323	149.877	3.21636	149.748	3.37756	149.631	3.54721	149.524
1.7	2.92921	154.375	3.07413	154.246	3.22675	154.129	3.38745	154.023	3.55663	153.927
1.75	2.93938	158.698	3.08382	158.586	3.23598	158.484	3.39624	158.392	3.56500	158.308
1.8	2.94804	162.992	3.09206	162.900	3.24384	162.816	3.40373	162.740	3.57213	162.670
1.85	2.95498	167.265	3.09869	167.194	3.25015	167.129	3.40975	167.071	3.57788	167.017
1.9	2.96006	171.520	3.10353	171.471	3.25477	171.428	3.41415	171.388	3.58207	171.352
1.95	2.96315	175.763	3.10648	175.738	3.25759	175.716	3.41683	175.696	3.58462	175.678
2.0	2.96419	180.000	3.10747	180.000	3.25853	180.000	3.41773	180.000	3.58548	180.000

Example. $\cosh(1.95 + i\,\underline{1.25}) = 3.46441 \underline{/113°.332} = 3.46441 \underline{/113°.19'.55''}.$

TABLE XI. HYPERBOLIC COSINES. $\cosh (x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 2.0$		$x = 2.05$		$x = 2.1$		$x = 2.15$		$x = 2.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	3.76220	0.000	3.94832	0.000	4.14431	0.000	4.35067	0.000	4.56791	0.000
0.05	3.76137	4.339	3.94753	4.354	4.14357	4.368	4.34996	4.380	4.56723	4.391
0.1	3.75894	8.681	3.94521	8.711	4.14136	8.738	4.34785	8.763	4.56523	8.785
0.15	3.75495	13.031	3.94142	13.075	4.13774	13.115	4.34440	13.151	4.56167	13.184
0.2	3.74948	17.392	3.93620	17.449	4.13278	17.501	4.33968	17.548	4.55744	17.591
0.25	3.74268	21.768	3.92972	21.836	4.12661	21.899	4.33381	21.956	4.55184	22.007
0.3	3.73470	26.160	3.92213	26.239	4.11938	26.311	4.32693	26.376	4.54529	26.435
0.35	3.72574	30.573	3.91359	30.660	4.11125	30.740	4.31918	30.812	4.53793	30.877
0.4	3.71600	35.008	3.90432	35.102	4.10243	35.187	4.31079	35.264	4.52993	35.334
0.45	3.70572	39.467	3.89453	39.565	4.09311	39.653	4.30193	39.734	4.52150	39.807
0.5	3.69515	43.951	3.88448	44.051	4.08355	44.141	4.29282	44.223	4.51285	44.297
0.55	3.68455	48.461	3.87440	48.560	4.07396	48.649	4.28371	48.730	4.50417	48.804
0.6	3.67418	52.996	3.86454	53.092	4.06459	53.179	4.27479	53.257	4.49570	53.329
0.65	3.66430	57.557	3.85515	57.647	4.05566	57.729	4.26630	57.803	4.48763	57.870
0.7	3.65517	62.142	3.84648	62.224	4.04740	62.299	4.25846	62.366	4.48017	62.427
0.75	3.64699	66.748	3.83870	66.820	4.04002	66.886	4.25145	66.945	4.47350	66.998
0.8	3.64000	71.374	3.83206	71.434	4.03371	71.489	4.24544	71.538	4.46780	71.582
0.85	3.63437	76.016	3.82671	76.062	4.02863	76.105	4.24061	76.143	4.46322	76.177
0.9	3.63023	80.670	3.82279	80.702	4.02490	80.731	4.23707	80.757	4.45985	80.780
0.95	3.62771	85.333	3.82039	85.349	4.02263	85.364	4.23491	85.377	4.45779	85.389
1.0	3.62686	90.000	3.81958	90.000	4.02186	90.000	4.23419	90.000	4.45711	90.000
1.05	3.62771	94.667	3.82039	94.651	4.02263	94.636	4.23491	94.623	4.45779	94.611
1.1	3.63023	99.330	3.82279	99.298	4.02490	99.269	4.23707	99.243	4.45985	99.220
1.15	3.63437	103.984	3.82671	103.938	4.02863	103.895	4.24061	103.857	4.46322	103.823
1.2	3.64000	108.626	3.83206	108.566	4.03371	108.511	4.24544	108.462	4.46780	108.418
1.25	3.64699	113.252	3.83870	113.180	4.04002	113.114	4.25145	113.055	4.47350	113.002
1.3	3.65517	117.858	3.84648	117.776	4.04740	117.701	4.25846	117.634	4.48017	117.573
1.35	3.66430	122.443	3.85515	122.353	4.05566	122.271	4.26630	122.197	4.48763	122.130
1.4	3.67418	127.004	3.86454	126.908	4.06459	126.821	4.27479	126.743	4.49570	126.671
1.45	3.68455	131.539	3.87440	131.440	4.07396	131.351	4.28371	131.270	4.50417	131.196
1.5	3.69515	136.049	3.88448	135.950	4.08355	135.859	4.29282	135.778	4.51285	135.703
1.55	3.70572	140.533	3.89453	140.435	4.09311	140.347	4.30193	140.266	4.52150	140.193
1.6	3.71600	144.992	3.90432	144.898	4.10243	144.813	4.31079	144.736	4.52993	144.666
1.65	3.72574	149.427	3.91359	149.340	4.11125	149.260	4.31918	149.188	4.53793	149.123
1.7	3.73470	153.840	3.92213	153.761	4.11938	153.689	4.32693	153.624	4.54529	153.565
1.75	3.74268	158.232	3.92972	158.164	4.12661	158.101	4.33381	158.044	4.55184	157.993
1.8	3.74948	162.608	3.93620	162.551	4.13278	162.499	4.33968	162.452	4.55744	162.409
1.85	3.75495	166.969	3.94142	166.925	4.13774	166.885	4.34440	166.849	4.56167	166.816
1.9	3.75894	171.319	3.94521	171.289	4.14136	171.262	4.34785	171.237	4.56523	171.215
1.95	3.76137	175.661	3.94753	175.646	4.14357	175.632	4.34996	175.620	4.56723	175.609
2.0	3.76220	180.000	3.94832	180.000	4.14431	180.000	4.35067	180.000	4.56791	180.000

Example. $\cosh (2.0 + i\,\underline{0.5}) = 3.69515 \underline{/43^\circ.951} = 3.69515 \underline{/43^\circ.57'.04''}$.

TABLE XI. HYPERBOLIC COSINES. $\cosh(x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	4.79657	0.000	5.03722	0.000	5.29047	0.000	5.55695	0.000	5.83732	0.000
0.05	4.79593	4.401	5.03661	4.411	5.28989	4.419	5.55639	4.427	5.83680	4.434
0.1	4.79402	8.805	5.03479	8.824	5.28816	8.840	5.55474	8.856	5.83522	8.869
0.15	4.79088	13.214	5.03181	13.241	5.28531	13.265	5.55204	13.288	5.83265	13.308
0.2	4.78661	17.629	5.02773	17.664	5.28143	17.696	5.54834	17.725	5.82913	17.751
0.25	4.78127	22.053	5.02265	22.096	5.27662	22.134	5.54375	22.169	5.82476	22.200
0.3	4.77503	26.488	5.01672	26.537	5.27096	26.581	5.53837	26.620	5.81964	26.656
0.35	4.76802	30.936	5.01005	30.989	5.26461	31.038	5.53233	31.081	5.81389	31.121
0.4	4.76042	35.397	5.00281	35.454	5.25772	35.506	5.52578	35.553	5.80765	35.595
0.45	4.75240	39.873	4.99518	39.932	5.25046	39.986	5.51887	40.035	5.80108	40.079
0.5	4.74415	44.364	4.98734	44.424	5.23728	44.479	5.51177	44.529	5.79434	44.573
0.55	4.73592	48.870	4.97950	48.930	5.23553	48.984	5.50468	49.034	5.78758	49.078
0.6	4.72784	53.392	4.97183	53.451	5.22825	53.503	5.49775	53.551	5.78099	53.593
0.65	4.72017	57.930	4.96454	57.984	5.22131	58.034	5.49115	58.078	5.77472	58.119
0.7	4.71308	62.482	4.95780	62.531	5.21490	62.576	5.48505	62.617	5.76892	62.653
0.75	4.70675	67.046	4.95177	67.090	5.20917	67.129	5.47961	67.165	5.76375	67.197
0.8	4.70134	71.622	4.94662	71.659	5.20428	71.691	5.47495	71.721	5.75932	71.748
0.85	4.69697	76.208	4.94249	76.236	5.20035	76.261	5.47122	76.284	5.75576	76.305
0.9	4.69377	80.801	4.93944	80.820	5.19745	80.837	5.46847	80.853	5.75316	80.867
0.95	4.69182	85.399	4.93759	85.409	5.19569	85.418	5.46679	85.426	5.75156	85.433
1.0	4.69117	90.000	4.93696	90.000	5.19510	90.000	5.46623	90.000	5.75103	90.000
1.05	4.69182	94.601	4.93759	94.591	5.19569	94.582	5.46679	94.574	5.75156	94.567
1.1	4.69377	99.199	4.93944	99.180	5.19745	99.163	5.46847	99.147	5.75316	99.133
1.15	4.69697	103.792	4.94249	103.764	5.20035	103.739	5.47122	103.716	5.75576	103.695
1.2	4.70134	108.378	4.94662	108.341	5.20428	108.309	5.47495	108.279	5.75932	108.252
1.25	4.70675	112.954	4.95177	112.910	5.20917	112.871	5.47961	112.835	5.76375	112.803
1.3	4.71308	117.518	4.95780	117.469	5.21490	117.424	5.48505	117.383	5.76892	117.347
1.35	4.72017	122.070	4.96454	122.016	5.22131	121.966	5.49115	121.922	5.77472	121.881
1.4	4.72784	126.608	4.97183	126.549	5.22825	126.497	5.49775	126.449	5.78099	126.407
1.45	4.73592	131.130	4.97950	131.070	5.23553	131.016	5.50468	130.966	5.78758	130.922
1.5	4.74415	135.636	4.98734	135.576	5.23728	135.521	5.51177	135.471	5.79434	135.427
1.55	4.75240	140.127	4.99518	140.068	5.25046	140.014	5.51887	139.965	5.80108	139.921
1.6	4.76042	144.603	5.00281	144.546	5.25772	144.494	5.52578	144.447	5.80765	144.405
1.65	4.76802	149.064	5.01005	149.011	5.26461	148.962	5.53233	148.919	5.81389	148.879
1.7	4.77503	153.512	5.01672	153.463	5.27096	153.419	5.53837	153.380	5.81964	153.344
1.75	4.78127	157.947	5.02265	157.904	5.27662	157.866	5.54375	157.831	5.82476	157.800
1.8	4.78661	162.371	5.02773	162.336	5.28143	162.304	5.54834	162.275	5.82913	162.249
1.85	4.79088	166.786	5.03181	166.759	5.28531	166.735	5.55204	166.712	5.83265	166.692
1.9	4.79402	171.195	5.03479	171.176	5.28816	171.160	5.55474	171.144	5.83522	171.131
1.95	4.79593	175.599	5.03661	175.589	5.28989	175.581	5.55639	175.573	5.83680	175.566
2.0	4.79657	180.000	5.03722	180.000	5.29047	180.000	5.55695	180.000	5.83732	180.000

Example. $\cosh(2.40 + i\,\underline{2.0}) = 5.55695 \underline{/180°} = 5.55695 \overline{\backslash 180°}$.

	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	6.13229	0.000	6.44259	0.000	6.76901	0.000	7.11234	0.000	7.47347	0.000
0.05	6.13179	4.440	6.44212	4.446	6.76855	4.451	7.11191	4.456	7.47306	4.460
0.1	6.13030	8.881	6.44069	8.893	6.76720	8.903	7.11062	8.912	7.47183	8.920
0.15	6.12785	13.326	6.43836	13.342	6.76499	13.357	7.10851	13.371	7.46982	13.383
0.2	6.12450	17.774	6.43518	17.796	6.76195	17.815	7.10563	17.833	7.46708	17.848
0.25	6.12034	22.228	6.43121	22.254	6.75818	22.278	7.10204	22.299	7.46366	22.318
0.3	6.11547	26.689	6.42658	26.718	6.75376	26.745	7.09784	26.770	7.45966	26.791
0.35	6.10999	31.157	6.42137	31.190	6.74881	31.219	7.09313	31.246	7.45518	31.270
0.4	6.10406	35.634	6.41572	35.668	6.74343	35.700	7.08802	35.728	7.45032	35.754
0.45	6.09781	40.119	6.40977	40.155	6.73778	40.188	7.08264	40.218	7.44519	40.245
0.5	6.09139	44.614	6.40367	44.651	6.73197	44.684	7.07711	44.713	7.43994	44.741
0.55	6.08496	49.118	6.39755	49.155	6.72616	49.187	7.07158	49.217	7.43468	49.244
0.6	6.07869	53.632	6.39160	53.667	6.72048	53.699	7.06618	53.727	7.42955	53.754
0.65	6.07273	58.155	6.38592	58.188	6.71509	58.218	7.06105	58.244	7.42467	58.269
0.7	6.06722	62.686	6.38068	62.716	6.71011	62.743	7.05631	62.768	7.42017	62.790
0.75	6.06229	67.226	6.37601	67.252	6.70565	67.275	7.05208	67.297	7.41614	67.316
0.8	6.05808	71.772	6.37201	71.794	6.70185	71.813	7.04847	71.831	7.41271	71.847
0.85	6.05471	76.324	6.36879	76.340	6.69880	76.356	7.04556	76.369	7.40994	76.382
0.9	6.05223	80.880	6.36644	80.891	6.69656	80.902	7.04343	80.911	7.40791	80.920
0.95	6.05071	85.439	6.36499	85.445	6.69518	85.450	7.04213	85.455	7.40668	85.460
1.0	6.05020	90.000	6.36451	90.000	6.69473	90.000	7.04169	90.000	7.40626	90.000
1.05	6.05071	94.561	6.36499	94.555	6.69518	94.550	7.04213	94.545	7.40668	94.540
1.1	6.05223	99.120	6.36644	99.109	6.69656	99.098	7.04343	99.089	7.40791	99.080
1.15	6.05471	103.676	6.36879	103.660	6.69880	103.644	7.04556	103.631	7.40994	103.618
1.2	6.05808	108.228	6.37201	108.206	6.70185	108.187	7.04847	108.169	7.41271	108.153
1.25	6.06229	112.774	6.37601	112.748	6.70565	112.725	7.05208	112.703	7.41614	112.684
1.3	6.06722	117.314	6.38068	117.284	6.71011	117.257	7.05631	117.232	7.42017	117.210
1.35	6.07273	121.845	6.38592	121.812	6.71509	121.782	7.06105	121.756	7.42467	121.731
1.4	6.07869	126.368	6.39160	126.333	6.72048	126.301	7.06618	126.273	7.42955	126.246
1.45	6.08496	130.882	6.39755	130.845	6.72616	130.813	7.07158	130.783	7.43468	130.756
1.5	6.09139	135.386	6.40367	135.350	6.73197	135.316	7.07711	135.286	7.43994	135.259
1.55	6.09781	139.881	6.40977	139.845	6.73778	139.812	7.08264	139.782	7.44519	139.755
1.6	6.10406	144.366	6.41572	144.332	6.74343	144.300	7.08802	144.272	7.45032	144.246
1.65	6.10999	148.843	6.42137	148.810	6.74881	148.781	7.09313	148.754	7.45518	148.730
1.7	6.11547	153.311	6.42658	153.282	6.75376	153.255	7.09784	153.230	7.45966	153.209
1.75	6.12034	157.772	6.43121	157.746	6.75818	157.722	7.10204	157.701	7.46366	157.682
1.8	6.12450	162.226	6.43518	162.204	6.76195	162.185	7.10563	162.167	7.46708	162.152
1.85	6.12785	166.674	6.43836	166.658	6.76499	166.643	7.10851	166.629	7.46982	166.617
1.9	6.13030	171.119	6.44069	171.107	6.76720	171.097	7.11062	171.088	7.47183	171.080
1.95	6.13179	175.560	6.44212	175.554	6.76855	175.549	7.11191	175.544	7.47306	175.540
2.0	6.13229	180.000	6.44259	180.000	6.76901	180.000	7.11234	180.000	7.47347	180.000

Example. $\cosh(2.65 + i\,\underline{0.75}) = 7.05208 \angle 67°.297 = 7.05208 \angle 67°.17'.49''$.

	$x = 2.75$		$x = 2.8$		$x = 2.85$		$x = 2.9$		$x = 2.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	7.85328	0.000	8.25273	0.000	8.67281	0.000	9.11458	0.000	9.57915	0.000
0.05	7.85288	4.464	8.25235	4.467	8.67246	4.470	9.11424	4.473	9.57882	4.476
0.1	7.85172	8.928	8.25124	8.935	8.67140	8.941	9.11324	8.947	9.57787	8.952
0.15	7.84980	13.394	8.24942	13.404	8.66967	13.413	9.11160	13.421	9.57630	13.429
0.2	7.84720	17.863	8.24694	17.876	8.66731	17.888	9.10934	17.898	9.57416	17.908
0.25	7.84395	22.335	8.24385	22.351	8.66436	22.364	9.10655	22.378	9.57150	22.389
0.3	7.84015	26.811	8.24024	26.829	8.66092	26.845	9.10327	26.860	9.56838	26.873
0.35	7.83588	31.292	8.23617	31.312	8.65706	31.330	9.09959	31.346	9.56488	31.360
0.4	7.83125	35.778	8.23177	35.799	8.65287	35.818	9.09561	35.835	9.56109	35.851
0.45	7.82638	40.269	8.22713	40.291	8.64846	40.311	9.09142	40.329	9.55711	40.345
0.5	7.82138	44.766	8.22238	44.788	8.64395	44.808	9.08711	44.827	9.55301	44.843
0.55	7.81637	49.269	8.21762	49.290	8.63941	49.310	9.08281	49.329	9.54892	49.345
0.6	7.81149	53.777	8.21298	53.798	8.63500	53.817	9.07861	53.835	9.54492	53.850
0.65	7.80685	58.291	8.20857	58.311	8.63080	58.329	9.07461	58.345	9.54113	58.360
0.7	7.80257	62.810	8.20449	62.828	8.62691	62.845	9.07093	62.859	9.53762	62.873
0.75	7.79875	67.334	8.20085	67.350	8.62347	67.364	9.06764	67.377	9.53450	67.389
0.8	7.79547	71.862	8.19774	71.875	8.62051	71.887	9.06483	71.898	9.53182	71.907
0.85	7.79285	76.393	8.19524	76.404	8.61813	76.413	9.06257	76.421	9.52967	76.429
0.9	7.79092	80.927	8.19341	80.934	8.61639	80.940	9.06091	80.946	9.52809	80.951
0.95	7.78975	85.463	8.19230	85.467	8.61532	85.470	9.05990	85.473	9.52713	85.475
1.0	7.78935	90.000	8.19192	90.000	8.61497	90.000	9.05956	90.000	9.52681	90.000
1.05	7.78975	94.537	8.19230	94.533	8.61532	94.530	9.05990	94.527	9.52713	94.525
1.1	7.79092	99.073	8.19341	99.066	8.61639	99.060	9.06091	99.054	9.52809	99.049
1.15	7.79285	103.607	8.19524	103.596	8.61813	103.587	9.06257	103.579	9.52967	103.571
1.2	7.79547	108.138	8.19774	108.125	8.62051	108.113	9.06483	108.102	9.53182	108.093
1.25	7.79875	112.666	8.20085	112.650	8.62347	112.636	9.06764	112.623	9.53450	112.611
1.3	7.80257	117.190	8.20449	117.172	8.62691	117.155	9.07093	117.141	9.53762	117.127
1.35	7.80685	121.709	8.20857	121.689	8.63080	121.671	9.07461	121.655	9.54113	121.640
1.4	7.81149	126.223	8.21298	126.202	8.63500	126.183	9.07861	126.165	9.54492	126.150
1.45	7.81637	130.731	8.21762	130.710	8.63941	130.690	9.08281	130.671	9.54892	130.655
1.5	7.82138	135.234	8.22238	135.212	8.64395	135.192	9.08711	135.173	9.55301	135.157
1.55	7.82638	139.731	8.22713	139.709	8.64846	139.689	9.09142	139.671	9.55711	139.655
1.6	7.83125	144.222	8.23177	144.201	8.65287	144.182	9.09561	144.165	9.56109	144.149
1.65	7.83588	148.708	8.23617	148.688	8.65706	148.670	9.09959	148.654	9.56488	148.640
1.7	7.84015	153.189	8.24024	153.171	8.66092	153.155	9.10327	153.140	9.56838	153.127
1.75	7.84395	157.665	8.24385	157.649	8.66436	157.636	9.10655	157.622	9.57150	157.611
1.8	7.84720	162.137	8.24694	162.124	8.66731	162.112	9.10934	162.102	9.57416	162.092
1.85	7.84980	166.606	8.24942	166.596	8.66967	166.587	9.11160	166.579	9.57630	166.571
1.9	7.85172	171.072	8.25124	171.065	8.67140	171.059	9.11324	171.053	9.57787	171.048
1.95	7.85288	175.536	8.25235	175.533	8.67246	175.530	9.11424	175.527	9.57882	175.524
2.0	7.85328	180.000	8.25273	180.000	8.67281	180.000	9.11458	180.000	9.57915	180.000

Example. $\cosh(2.90 + i\,\underline{0.9}) = 9.06091 \,\underline{/80°.946} = 0.96091 \,\underline{/80°.56'.46''}.$

Table XI. HYPERBOLIC COSINES. $\cosh(x + iq) = r \angle \gamma$. Continued

	$x = 3.0$		$x = 3.05$		$x = 3.1$		$x = 3.15$		$x = 3.2$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	10.06766	0.000	10.58135	0.000	11.12150	0.000	11.68946	0.000	12.28665	0.000
0.05	10.06737	4.478	10.58110	4.480	11.12120	4.482	11.68920	4.484	12.28640	4.485
0.1	10.06645	8.956	10.58020	8.960	11.12040	8.964	11.68840	8.968	12.28560	8.971
0.15	10.06500	13.436	10.57880	13.442	11.11900	13.447	11.68710	13.452	12.28440	13.457
0.2	10.06292	17.917	10.57680	17.925	11.11720	17.932	11.68540	17.938	12.28280	17.944
0.25	10.06040	22.400	10.57440	22.409	11.11490	22.418	11.68320	22.426	12.28070	22.433
0.3	10.05743	26.886	10.57160	26.896	11.11220	26.906	11.68060	26.915	12.27820	26.923
0.35	10.05410	31.374	10.56840	31.386	11.10920	31.396	11.67780	31.406	12.27550	31.415
0.4	10.05050	35.865	10.56500	35.878	11.10600	35.890	11.67470	35.900	12.27260	35.910
0.45	10.04670	40.360	10.56140	40.373	11.10250	40.385	11.67140	40.396	12.26950	40.406
0.5	10.04280	44.858	10.55770	44.871	11.09900	44.884	11.66810	44.895	12.26630	44.905
0.55	10.03890	49.360	10.55400	49.373	11.09540	49.385	11.66470	49.396	12.26310	49.406
0.6	10.03510	53.865	10.55040	53.878	11.09200	53.889	11.66140	53.900	12.26000	53.909
0.65	10.03150	58.373	10.54690	58.385	11.08880	58.396	11.65830	58.406	12.25700	58.415
0.7	10.02820	62.885	10.54380	62.896	11.08580	62.906	11.65540	62.915	12.25430	62.923
0.75	10.02520	67.399	10.54090	67.409	11.08310	67.417	11.65290	67.425	12.25180	67.432
0.8	10.02260	71.916	10.53850	71.924	11.08080	71.932	11.65070	71.938	12.24980	71.944
0.85	10.02060	76.435	10.53660	76.441	11.07890	76.447	11.64890	76.452	12.24810	76.457
0.9	10.01910	80.956	10.53520	80.960	11.07750	80.964	11.64770	80.967	12.24690	80.970
0.95	10.01820	85.478	10.53430	85.480	11.07670	85.482	11.64690	85.484	12.24610	85.485
1.0	10.01787	90.000	10.53399	90.000	11.07645	90.000	11.64661	90.000	12.24588	90.000
1.05	10.01820	94.522	10.53430	94.520	11.07670	94.518	11.64690	94.516	12.24610	94.515
1.1	10.01910	99.044	10.53520	99.040	11.07750	99.036	11.64770	99.033	12.24690	99.030
1.15	10.02060	103.565	10.53660	103.559	11.07890	103.553	11.64890	103.548	12.24810	103.543
1.2	10.02260	108.084	10.53850	108.076	11.08080	108.068	11.65070	108.062	12.24980	108.056
1.25	10.02520	112.601	10.54090	112.591	11.08310	112.583	11.65290	112.575	12.25180	112.568
1.3	10.02820	117.115	10.54380	117.104	11.08580	117.094	11.65540	117.085	12.25430	117.077
1.35	10.03150	121.627	10.54690	121.615	11.08880	121.604	11.65830	121.594	12.25700	121.585
1.4	10.03510	126.135	10.55040	126.122	11.09200	126.111	11.66140	126.100	12.26000	126.091
1.45	10.03890	130.640	10.55400	130.627	11.09540	130.615	11.66470	130.604	12.26310	130.594
1.5	10.04280	135.142	10.55770	135.129	11.09900	135.116	11.66810	135.105	12.26630	135.095
1.55	10.04670	139.640	10.56140	139.627	11.10250	139.615	11.67140	139.604	12.26950	139.594
1.6	10.05050	144.135	10.56500	144.122	11.10600	144.110	11.67470	144.100	12.27260	144.090
1.65	10.05410	148.626	10.56840	148.614	11.10920	148.604	11.67780	148.594	12.27550	148.585
1.7	10.05743	153.114	10.57160	153.104	11.11220	153.094	11.68060	153.085	12.27820	153.077
1.75	10.06040	157.600	10.57440	157.591	11.11490	157.582	11.68320	157.574	12.28070	157.567
1.8	10.06292	162.083	10.57680	162.075	11.11720	162.068	11.68540	162.062	12.28280	162.056
1.85	10.06500	166.564	10.57880	166.558	11.11900	166.553	11.68710	166.548	12.28440	166.543
1.9	10.06645	171.044	10.58020	171.040	11.12040	171.036	11.68840	171.032	12.28560	171.029
1.95	10.06737	175.522	10.58110	175.520	11.12120	175.518	11.68920	175.516	12.28640	175.515
2.0	10.06766	180.000	10.58135	180.000	11.12150	180.000	11.68946	180.000	12.28665	180.000

Example. $\cosh(3.15 + i\,\underline{0.15}) = 11.68710 \underline{/13°.452} = 11.68710 \underline{/13°.27'.07''}$.

TABLE XI. HYPERBOLIC COSINES. $\cosh(x + iq) = r\,\underline{/\gamma}$. CONTINUED

	$x = 3.25$		$x = 3.3$		$x = 3.35$		$x = 3.4$		$x = 3.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	12.91456	0.000	13.57476	0.000	14.26891	0.000	14.99874	0.000	15.76607	0.000
0.05	12.91430	4.486	13.57455	4.488	14.26870	4.489	14.99853	4.490	15.76587	4.491
0.1	12.91360	8.973	13.57387	8.976	14.26805	8.978	14.99790	8.980	15.76530	8.982
0.15	12.91240	13.461	13.57275	13.465	14.26700	13.468	14.99692	13.471	15.76433	13.474
0.2	12.91085	17.949	13.57123	17.954	14.26556	17.959	14.99555	17.963	15.76303	17.966
0.25	12.90888	22.439	13.56936	22.445	14.26377	22.450	14.99385	22.455	15.76144	22.459
0.3	12.90658	26.930	13.56718	26.937	14.26167	26.943	14.99186	26.948	15.75950	26.953
0.35	12.90398	31.423	13.56470	31.431	14.25933	31.437	14.98960	31.443	15.75740	31.449
0.4	12.90117	35.918	13.56203	35.926	14.25614	35.933	14.98721	35.939	15.75510	35.945
0.45	12.89820	40.415	13.55918	40.423	14.25412	40.430	14.98466	40.437	15.75270	40.443
0.5	12.89518	44.914	13.55633	44.922	14.25137	44.929	14.98205	44.936	15.75020	44.942
0.55	12.89215	49.415	13.55346	49.423	14.24863	49.430	14.97945	49.437	15.74772	49.443
0.6	12.88910	53.918	13.55062	53.926	14.24595	53.933	14.97690	53.939	15.74529	53.945
0.65	12.88637	58.423	13.54796	58.431	14.24339	58.437	14.97448	58.443	15.74300	58.449
0.7	12.88380	62.930	13.54550	62.937	14.24106	62.943	14.97225	62.948	15.74088	62.953
0.75	12.88146	67.439	13.54322	67.445	14.23897	67.450	14.97023	67.455	15.73898	67.459
0.8	12.87949	71.949	13.54141	71.954	14.23718	71.959	14.96855	71.963	15.73736	71.966
0.85	12.87790	76.461	13.53991	76.465	14.23573	76.468	14.96716	76.471	15.73603	76.474
0.9	12.87670	80.973	13.53878	80.976	14.23470	80.978	14.96616	80.980	15.73510	80.982
0.95	12.87600	85.486	13.53810	85.488	14.23403	85.489	14.96556	85.490	15.73450	85.491
1.0	12.87578	90.000	13.53788	90.000	14.23382	90.000	14.96536	90.000	15.73432	90.000
1.05	12.87600	94.514	13.53810	94.512	14.23403	94.511	14.96556	94.510	15.73450	94.509
1.1	12.87670	99.027	13.53878	99.024	14.23470	99.022	14.96616	99.020	15.73510	99.018
1.15	12.87790	103.539	13.53991	103.535	14.23573	103.532	14.96716	103.529	15.73603	103.526
1.2	12.87949	108.051	13.54141	108.046	14.23718	108.041	14.96855	108.037	15.73736	108.034
1.25	12.88146	112.561	13.54322	112.555	14.23897	112.550	14.97023	112.545	15.73898	112.541
1.3	12.88380	117.070	13.54550	117.063	14.24106	117.057	14.97225	117.052	15.74088	117.047
1.35	12.88637	121.577	13.54796	121.569	14.24339	121.563	14.97448	121.557	15.74300	121.551
1.4	12.88910	126.082	13.55062	126.074	14.24595	126.067	14.97690	126.061	15.74529	126.055
1.45	12.89215	130.585	13.55346	130.577	14.24863	130.570	14.97945	130.563	15.74772	130.557
1.5	12.89518	135.086	13.55633	135.078	14.25137	135.071	14.98205	135.064	15.75020	135.058
1.55	12.89820	139.585	13.55918	139.577	14.25412	139.570	14.98466	139.563	15.75270	139.557
1.6	12.90117	144.082	13.56203	144.074	14.25614	144.067	14.98721	144.061	15.75510	144.055
1.65	12.90398	148.577	13.56470	148.569	14.25933	148.563	14.98960	148.557	15.75740	148.551
1.7	12.90658	153.070	13.56718	153.063	14.26167	153.057	14.99186	153.052	15.75950	153.047
1.75	12.90888	157.561	13.56936	157.555	14.26377	157.550	14.99385	157.545	15.76144	157.541
1.8	12.91085	162.051	13.57123	162.046	14.26556	162.041	14.99555	162.037	15.76303	162.034
1.85	12.91240	166.539	13.57275	166.535	14.26700	166.532	14.99692	166.529	15.76433	166.526
1.9	12.91360	171.027	13.57387	171.024	14.26805	171.022	14.99790	171.020	15.76530	171.018
1.95	12.91430	175.514	13.57455	175.512	14.26870	175.511	14.99853	175.510	15.76587	175.509
2.0	12.91456	180.000	13.57476	180.000	14.26891	180.000	14.99874	180.000	15.76607	180.000

Example. $\cosh(3.4 + i\,\underline{0.75}) = 14.97023\,\underline{/67°.455} = 14.97023\,\underline{/67°.27'.18''}.$

	x = 3.5		x = 3.55		x = 3.6		x = 3.65		x = 3.7	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	16.57282	0.000	17.42102	0.000	18.31278	0.000	19.25033	0.000	20.23601	0.000
0.05	16.57260	4.492	17.42083	4.493	18.31260	4.493	19.25015	4.494	20.23585	4.495
0.1	16.57210	8.984	17.42030	8.985	18.31210	8.987	19.24970	8.988	20.23540	8.989
0.15	16.57120	13.476	17.41945	13.479	18.31130	13.481	19.24890	13.483	20.23460	13.484
0.2	16.56996	17.969	17.41830	17.972	18.31020	17.975	19.24790	17.977	20.23365	17.979
0.25	16.56840	22.463	17.41680	22.467	18.30880	22.470	19.24650	22.473	20.23240	22.475
0.3	16.56660	26.958	17.41510	26.962	18.30715	26.965	19.24496	26.969	20.23090	26.972
0.35	16.56460	31.454	17.41310	31.458	18.30530	31.462	19.24323	31.466	20.22930	31.469
0.4	16.56240	35.950	17.41110	35.955	18.30335	35.959	19.24134	35.963	20.22750	35.967
0.45	16.56010	40.448	17.40900	40.453	18.30126	40.458	19.23940	40.462	20.22560	40.465
0.5	16.55770	44.948	17.40665	44.953	18.29910	44.957	19.23732	44.961	20.22365	44.965
0.55	16.55538	49.448	17.40441	49.453	18.29699	49.458	19.23530	49.462	20.22170	49.465
0.6	16.55307	53.950	17.40222	53.955	18.29490	53.959	19.23331	53.963	20.21981	53.967
0.65	16.55087	58.454	17.40015	58.458	18.29292	58.462	19.23142	58.465	20.21804	58.469
0.7	16.54885	62.958	17.39822	62.962	18.29109	62.965	19.22968	62.969	20.21639	62.972
0.75	16.54702	67.463	17.39650	67.466	18.28942	67.470	19.22813	67.473	20.21490	67.475
0.8	16.54550	71.969	17.39504	71.972	18.28805	71.975	19.22681	71.977	20.21365	71.979
0.85	16.54428	76.476	17.39386	76.479	18.28694	76.481	19.22577	76.483	20.21268	76.484
0.9	16.54337	80.984	17.39300	80.985	18.28611	80.987	19.22496	80.988	20.21189	80.989
0.95	16.54281	85.492	17.39248	85.493	18.28560	85.493	19.22448	85.494	20.21140	85.495
1.0	16.54263	90.000	17.39230	90.000	18.28546	90.000	19.22434	90.000	20.21129	90.000
1.05	16.54281	94.508	17.39248	94.507	18.28560	94.507	19.22448	94.506	20.21140	94.506
1.1	16.54337	99.016	17.39300	99.015	18.28611	99.013	19.22496	99.012	20.21189	99.011
1.15	16.54428	103.524	17.39386	103.522	18.28694	103.519	19.22577	103.518	20.21268	103.516
1.2	16.54550	108.031	17.39504	108.028	18.28805	108.025	19.22681	108.023	20.21365	108.021
1.25	16.54702	112.537	17.39650	112.534	18.28942	112.530	19.22813	112.527	20.21490	112.525
1.3	16.54885	117.042	17.39822	117.038	18.29109	117.035	19.22968	117.031	20.21639	117.028
1.35	16.55087	121.547	17.40015	121.542	18.29292	121.538	19.23142	121.535	20.21804	121.531
1.4	16.55307	126.050	17.40222	126.045	18.29490	126.041	19.23331	126.037	20.21981	126.033
1.45	16.55538	130.552	17.40441	130.547	18.29699	130.542	19.23530	130.538	20.22170	130.535
1.5	16.55770	135.052	17.40665	135.047	18.29910	135.043	19.23732	135.039	20.22365	135.035
1.55	16.56010	139.552	17.40900	139.547	18.30126	139.542	19.23940	139.538	20.22560	139.535
1.6	16.56240	144.050	17.41110	144.045	18.30335	144.041	19.24134	144.037	20.22750	144.033
1.65	16.56460	148.546	17.41310	148.542	18.30530	148.538	19.24323	148.534	20.22930	148.531
1.7	16.56660	153.042	17.41510	153.038	18.30715	153.035	19.24496	153.031	20.23090	153.028
1.75	16.56840	157.537	17.41680	157.533	18.30880	157.530	19.24650	157.527	20.23240	157.525
1.8	16.56996	162.031	17.41830	162.028	18.31020	162.025	19.24790	162.023	20.23365	162.021
1.85	16.57120	166.524	17.41945	166.521	18.31130	166.519	19.24890	166.517	20.23460	166.516
1.9	16.57210	171.016	17.42030	171.015	18.31210	171.013	19.24970	171.012	20.23540	171.011
1.95	16.57260	175.508	17.42083	175.507	18.31260	175.507	19.25015	175.506	20.23585	175.505
2.0	16.57282	180.000	17.42102	180.000	18.31278	180.000	19.25033	180.000	20.23601	180.000

Example. $\cosh (3.65 + i\,\underline{0.05}) = 19.25015 \underline{/4°.494} = 19.25015 \underline{/4°.29'.38''}$.

TABLE XI. HYPERBOLIC COSINES. $\cosh (x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 3.75$		$x = 3.8$		$x = 3.85$		$x = 3.9$		$x = 3.95$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	21.27230	0.000	22.36178	0.000	23.50717	0.000	24.71135	0.000	25.97731	0.000
0.05	21.27212	4.495	22.36163	4.495	23.50702	4.496	24.71120	4.496	25.97720	4.497
0.1	21.27170	8.990	22.36122	8.991	23.50664	8.992	24.71090	8.993	25.97680	8.993
0.15	21.27100	13.486	22.36055	13.487	23.50600	13.488	24.71024	13.489	25.97630	13.490
0.2	21.27000	17.981	22.35962	17.983	23.50512	17.985	24.70940	17.986	25.97550	17.988
0.25	21.26885	22.478	22.35850	22.480	23.50404	22.482	24.70840	22.483	25.97450	22.485
0.3	21.26745	26.974	22.35716	26.977	23.50277	26.979	24.70720	26.981	25.97337	26.983
0.35	21.26586	31.472	22.35565	31.474	23.50136	31.477	24.70580	31.479	25.97206	31.481
0.4	21.26415	35.970	22.35403	35.973	23.49980	35.975	24.70440	35.978	25.97066	35.980
0.45	21.26236	40.469	22.35230	40.472	23.49820	40.474	24.70280	40.477	25.96920	40.479
0.5	21.26052	44.968	22.35060	44.971	23.49650	44.974	24.70120	44.977	25.96770	44.979
0.55	21.25869	49.469	22.34883	49.472	23.49486	49.474	24.69964	49.477	25.96618	49.479
0.6	21.25685	53.970	22.34712	53.973	23.49322	53.975	24.69809	53.978	25.96471	53.980
0.65	21.25520	58.472	22.34550	58.474	23.49115	58.477	24.69662	58.479	25.96333	58.481
0.7	21.25362	62.974	22.34401	62.977	23.49028	62.979	24.69528	62.981	25.96205	62.983
0.75	21.25221	67.478	22.34270	67.480	23.48900	67.482	24.69406	67.483	25.96090	67.485
0.8	21.25102	71.981	22.34153	71.983	23.48791	71.985	24.69302	71.986	25.95991	71.988
0.85	21.25006	76.486	22.34061	76.487	23.48704	76.488	24.69223	76.489	25.95911	76.490
0.9	21.24935	80.990	22.33995	80.991	23.48640	80.992	24.69159	80.993	25.95854	80.993
0.95	21.24891	85.495	22.33952	85.496	23.48601	85.496	24.69120	85.496	25.95820	85.497
1.0	21.24878	90.000	22.33941	90.000	23.48589	90.000	24.69110	90.000	25.95806	90.000
1.05	21.24891	94.505	22.33952	94.504	23.48601	94.504	24.69120	94.504	25.95820	94.503
1.1	21.24935	99.010	22.33995	99.009	23.48640	99.008	24.69159	99.007	25.95854	99.007
1.15	21.25006	103.514	22.34061	103.513	23.48704	103.512	24.69223	103.511	25.95911	103.510
1.2	21.25102	108.019	22.34153	108.017	23.48791	108.015	24.69302	108.014	25.95991	108.013
1.25	21.25221	112.522	22.34270	112.520	23.48900	112.518	24.69406	112.517	25.96090	112.515
1.3	21.25362	117.026	22.34401	117.023	23.49028	117.021	24.69528	117.019	25.96205	117.017
1.35	21.25520	121.528	22.34550	121.526	23.49115	121.523	24.69662	121.521	25.96333	121.519
1.4	21.25685	126.030	22.34712	126.027	23.49322	126.025	24.69809	126.022	25.96471	126.020
1.45	21.25869	130.531	22.34883	130.528	23.49486	130.525	24.69964	130.523	25.96618	130.521
1.5	21.26052	135.032	22.35060	135.029	23.49650	135.026	24.70120	135.023	25.96770	135.021
1.55	21.26236	139.531	22.35230	139.528	23.49820	139.526	24.70280	139.523	25.96920	139.521
1.6	21.26415	144.030	22.35403	144.027	23.49980	144.025	24.70440	144.022	25.97066	144.020
1.65	21.26586	148.528	22.35565	148.526	23.50136	148.523	24.70580	148.521	25.97206	148.519
1.7	21.26745	153.026	22.35716	153.023	23.50277	153.021	24.70720	153.019	25.97337	153.017
1.75	21.26885	157.522	22.35850	157.520	23.50404	157.518	24.70840	157.517	25.97450	157.515
1.8	21.27000	162.019	22.35962	162.017	23.50512	162.015	24.70940	162.014	25.97550	162.012
1.85	21.27100	166.514	22.36055	166.513	23.50600	166.512	24.71024	166.511	25.97630	166.510
1.9	21.27170	171.010	22.36122	171.009	23.50664	171.008	24.71090	171.007	25.97680	171.007
1.95	21.27212	175.505	22.36163	175.505	23.50702	175.504	24.71120	175.504	25.97720	175.503
2.0	21.27230	180.000	22.36178	180.000	23.50717	180.000	24.71135	180.000	25.97731	180.000

Example. $\cosh (3.85 + i\,\underline{1.05}) = 23.48601 \underline{/94^\circ.504} = 23.48601 \underline{/94^\circ.30'.14''}$.

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r\,\underline{/\gamma}$

	$x = 0$		$x = 0.05$		$x = 0.1$		$x = 0.15$		$x = 0.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.00	90	0.04996	0.00	0.09967	0.00	0.14889	0.00	0.19738	0.00
0.05	0.07870	90	0.09322	57.368	0.12699	37.846	0.16840	27.190	0.21246	20.849
0.1	0.15838	90	0.16607	72.040	0.18711	56.914	0.21732	45.420	0.25294	36.955
0.15	0.24008	90	0.24520	77.558	0.25987	66.084	0.28232	56.148	0.31045	47.863
0.2	0.32492	90	0.32870	80.329	0.33969	71.092	0.35699	62.612	0.37939	55.054
0.25	0.41421	90	0.41727	81.937	0.42568	74.107	0.43932	66.700	0.45731	59.848
0.3	0.50953	90	0.51180	82.942	0.51851	76.025	0.52931	69.373	0.54368	63.082
0.35	0.61280	90	0.61455	83.585	0.61970	77.267	0.62802	71.131	0.63915	65.250
0.4	0.72654	90	0.72778	83.987	0.73143	78.047	0.73734	72.245	0.74525	66.641
0.45	0.85408	90	0.85476	84.209	0.85678	78.478	0.86004	72.864	0.86439	67.419
0.5	1.00000	90	1.00000	84.279	1.00000	78.616	1.00000	73.064	1.00000	67.670
0.55	1.17085	90	1.16991	84.209	1.16717	78.478	1.16274	72.864	1.15688	67.419
0.6	1.37638	90	1.37404	83.987	1.36718	78.047	1.35623	72.245	1.34183	66.641
0.65	1.63185	90	1.62722	83.585	1.61369	77.267	1.59231	71.131	1.56459	65.250
0.7	1.96261	90	1.95388	82.942	1.92859	76.025	1.88925	69.373	1.83933	63.082
0.75	2.41421	90	2.39735	81.937	2.34919	74.107	2.27623	66.700	2.18669	59.848
0.8	3.07768	90	3.04234	80.329	2.94391	71.092	2.80120	62.612	2.63581	55.054
0.85	4.16530	90	4.07824	77.558	3.84810	66.084	3.54212	56.148	3.22115	47.863
0.9	6.31375	90	6.02149	72.040	5.34442	56.914	4.60155	45.420	3.95347	36.955
0.95	12.70620	90	10.72750	57.368	7.87464	37.846	5.93842	27.190	4.70673	20.849
1.0	∞	**90**	20.01667	**0.00**	10.03331	**0.00**	6.71659	**0.00**	5.06649	**0.00**
1.05	12.70620	**90**	10.72750	**57.368**	7.87464	**37.846**	5.93842	**27.190**	4.70673	**20.849**
1.1	6.31375	**90**	6.02149	**72.040**	5.34442	**56.914**	4.60155	**45.420**	3.95347	**36.955**
1.15	4.16530	**90**	4.07824	**77.558**	3.84810	**66.084**	3.54212	**56.148**	3.22115	**47.863**
1.2	3.07768	**90**	3.04234	**80.329**	2.94391	**71.092**	2.80120	**62.612**	2.63581	**55.054**
1.25	2.41421	**90**	2.39735	**81.937**	2.34919	**74.107**	2.27623	**66.700**	2.18669	**59.848**
1.3	1.96261	**90**	1.95388	**82.942**	1.92859	**76.025**	1.88925	**69.373**	1.83933	**63.082**
1.35	1.63185	**90**	1.62722	**83.585**	1.61369	**77.267**	1.59231	**71.131**	1.56459	**65.250**
1.4	1.37638	**90**	1.37404	**83.987**	1.36718	**78.047**	1.35623	**72.245**	1.34183	**66.641**
1.45	1.17085	**90**	1.16991	**84.209**	1.16717	**78.478**	1.16274	**72.864**	1.15688	**67.419**
1.5	1.00000	**90**	1.00000	**84.279**	1.00000	**78.616**	1.00000	**73.064**	1.00000	**67.670**
1.55	0.85408	**90**	0.85476	**84.209**	0.85678	**78.478**	0.86004	**72.864**	0.86439	**67.419**
1.6	0.72654	**90**	0.72778	**83.987**	0.73143	**78.047**	0.73734	**72.245**	0.74525	**66.641**
1.65	0.61280	**90**	0.61455	**83.585**	0.61970	**77.267**	0.62802	**71.131**	0.63915	**65.250**
1.7	0.50953	**90**	0.51180	**82.942**	0.51851	**76.025**	0.52931	**69.373**	0.54368	**63.082**
1.75	0.41421	**90**	0.41727	**81.937**	0.42568	**74.107**	0.43932	**66.700**	0.45731	**59.848**
1.8	0.32492	**90**	0.32870	**80.329**	0.33969	**71.092**	0.35699	**62.612**	0.37939	**55.054**
1.85	0.24008	**90**	0.24520	**77.558**	0.25987	**66.084**	0.28232	**56.148**	0.31045	**47.863**
1.9	0.15838	**90**	0.16607	**72.040**	0.18711	**56.914**	0.21732	**45.420**	0.25294	**36.955**
1.95	0.07870	**90**	0.09322	**57.368**	0.12699	**37.846**	0.16840	**27.190**	0.21246	**20.849**
2.0	0.00	**90**	0.04996	**0.00**	0.09967	**0.00**	0.14889	**0.00**	0.19738	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(0.1 + i\,\underline{0.25}) = 0.42568\,\underline{/74^\circ.107} = 0.42568\,\underline{/74^\circ.06'.25''}.$

$\tanh(0.1 + i\,\underline{1.2}) = 2.94391\,\overline{\backslash 71^\circ.092} = 2.94391\,\overline{\backslash 71^\circ.05'.31''}.$

Table XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \angle\gamma$. Continued

	$x = 0.25$		$x = 0.3$		$x = 0.35$		$x = 0.4$		$x = 0.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.24492	0.00	0.29131	0.00	0.33638	0.00	0.37995	0.00	0.42190	0.00
0.05	0.25721	16.710	0.30168	13.805	0.34534	11.652	0.38784	9.990	0.42894	8.665
0.1	0.29145	30.669	0.33123	25.891	0.37127	22.164	0.41090	19.185	0.44965	16.753
0.15	0.34237	41.063	0.37657	35.492	0.41192	30.900	0.44758	27.076	0.48295	23.858
0.2	0.40561	48.442	0.43445	42.715	0.46491	37.770	0.49617	33.498	0.52758	29.796
0.25	0.47875	53.612	0.50275	48.001	0.52849	42.989	0.55525	38.527	0.58242	34.560
0.3	0.56098	57.214	0.58056	51.799	0.60177	46.843	0.62401	42.331	0.64675	38.242
0.35	0.65262	59.679	0.66796	54.453	0.68466	49.590	0.70225	45.093	0.72031	40.958
0.4	0.75486	61.281	0.76580	56.200	0.77774	51.423	0.79033	46.961	0.80327	42.815
0.45	0.86968	62.184	0.87570	57.194	0.88225	52.474	0.88914	48.039	0.89620	43.896
0.5	1.00000	62.476	1.00000	57.518	1.00000	52.817	1.00000	48.392	1.00000	44.250
0.55	1.14985	62.184	1.14195	57.194	1.13347	52.474	1.12469	48.039	1.11583	43.896
0.6	1.32476	61.281	1.30582	56.200	1.28577	51.423	1.26529	46.961	1.24492	42.815
0.65	1.53228	59.679	1.49710	54.453	1.46059	49.590	1.42400	45.093	1.38830	40.958
0.7	1.78259	57.214	1.72246	51.799	1.66176	46.843	1.60255	42.331	1.54620	38.242
0.75	2.08878	53.612	1.98907	48.001	1.89219	42.989	1.80100	38.527	1.71698	34.560
0.8	2.46545	48.442	2.30177	42.715	2.15096	37.770	2.01545	33.498	1.89545	29.796
0.85	2.92081	41.063	2.65553	35.492	2.42764	30.900	2.23422	27.076	2.07060	23.858
0.9	3.43113	30.669	3.01903	25.891	2.69344	22.164	2.43370	19.185	2.22397	16.753
0.95	3.88795	16.710	3.31480	13.805	2.89571	11.652	2.57838	9.990	2.33132	8.665
1.0	4.08299	**0.00**	3.43274	**0.00**	2.97287	**0.00**	2.63193	**0.00**	2.37024	**0.00**
1.05	3.88795	**16.710**	3.31480	**13.805**	2.89571	**11.652**	2.57838	**9.990**	2.33132	**8.665**
1.1	3.43113	**30.669**	3.01903	**25.891**	2.69344	**22.164**	2.43370	**19.185**	2.22397	**16.753**
1.15	2.92081	**41.063**	2.65553	**35.492**	2.42764	**30.900**	2.23422	**27.076**	2.07060	**23.858**
1.2	2.46545	**48.442**	2.30177	**42.715**	2.15096	**37.770**	2.01545	**33.498**	1.89545	**29.796**
1.25	2.08878	**53.612**	1.98907	**48.001**	1.89219	**42.989**	1.80100	**38.527**	1.71698	**34.560**
1.3	1.78259	**57.214**	1.72246	**51.799**	1.66176	**46.843**	1.60255	**42.331**	1.54620	**38.242**
1.35	1.53228	**59.679**	1.49710	**54.453**	1.46059	**49.590**	1.42400	**45.093**	1.38830	**40.958**
1.4	1.32476	**61.281**	1.30582	**56.200**	1.28577	**51.423**	1.26529	**46.961**	1.24492	**42.815**
1.45	1.14985	**62.184**	1.14195	**57.194**	1.13347	**52.474**	1.12469	**48.039**	1.11583	**43.896**
1.5	1.00000	**62.476**	1.00000	**57.518**	1.00000	**52.817**	1.00000	**48.392**	1.00000	**44.250**
1.55	0.86968	**62.184**	0.87570	**57.194**	0.88225	**52.474**	0.88914	**48.039**	0.89620	**43.896**
1.6	0.75486	**61.281**	0.76580	**56.200**	0.77774	**51.423**	0.79033	**46.961**	0.80327	**42.815**
1.65	0.65262	**59.679**	0.66796	**54.453**	0.68466	**49.590**	0.70225	**45.093**	0.72031	**40.958**
1.7	0.56098	**57.214**	0.58056	**51.799**	0.60177	**46.843**	0.62401	**42.331**	0.64675	**38.242**
1.75	0.47875	**53.612**	0.50275	**48.001**	0.52849	**42.989**	0.55525	**38.527**	0.58242	**34.560**
1.8	0.40561	**48.442**	0.43445	**42.715**	0.46491	**37.770**	0.49617	**33.498**	0.52758	**29.796**
1.85	0.34237	**41.063**	0.37657	**35.492**	0.41192	**30.900**	0.44758	**27.076**	0.48295	**23.858**
1.9	0.29145	**30.669**	0.33123	**25.891**	0.37127	**22.164**	0.41090	**19.185**	0.44965	**16.753**
1.95	0.25721	**16.710**	0.30168	**13.805**	0.34534	**11.652**	0.38784	**9.990**	0.42894	**8.665**
2.0	0.24492	**0.00**	0.29131	**0.00**	0.33638	**0.00**	0.37995	**0.00**	0.42190	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(0.4 + i\,0) = 0.37995 \angle 0°$.

$\tanh(0.45 + i\,\underline{1.1}) = 2.22397 \overline{\backslash 16°.753} = 2.22397 \overline{\backslash 16°.45'.11''}$.

Table XII. HYPERBOLIC TANGENTS. tanh $(x + iq) = r \angle \gamma$. Continued

	$x = 0.5$		$x = 0.55$		$x = 0.6$		$x = 0.65$		$x = 0.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.46211	0.00	0.50052	0.00	0.53704	0.00	0.57167	0.00	0.60437	0.00
0.05	0.46846	7.582	0.50628	6.680	0.54230	5.917	0.57648	5.263	0.60878	4.696
0.1	0.48720	14.732	0.52334	13.027	0.55790	11.570	0.59079	10.312	0.62194	9.217
0.15	0.51758	21.122	0.55115	18.773	0.58344	16.739	0.61428	14.966	0.64357	13.409
0.2	0.55865	26.572	0.58900	23.753	0.61835	21.276	0.64650	19.090	0.67331	17.153
0.25	0.60952	31.035	0.63616	27.897	0.66205	25.101	0.68696	22.604	0.71076	20.372
0.3	0.66956	34.544	0.69209	31.204	0.71405	28.190	0.73523	25.471	0.75548	23.017
0.35	0.73847	37.169	0.75645	33.707	0.77399	30.553	0.79092	27.683	0.80711	25.074
0.4	0.81628	38.983	0.82914	35.453	0.84168	32.214	0.85377	29.248	0.86531	26.539
0.45	0.90328	40.046	0.91025	36.482	0.91703	33.198	0.92354	30.180	0.92973	27.414
0.5	1.00000	40.395	1.00000	36.822	1.00000	33.524	1.00000	30.489	1.00000	27.705
0.55	1.10708	40.046	1.09860	36.482	1.09048	33.198	1.08279	30.180	1.07558	27.414
0.6	1.22508	38.983	1.20607	35.453	1.18810	32.214	1.17128	29.248	1.15566	26.539
0.65	1.35414	37.169	1.32197	33.707	1.29201	30.553	1.26434	27.683	1.23898	25.074
0.7	1.49352	34.544	1.44490	31.204	1.40047	28.190	1.36012	25.471	1.32366	23.017
0.75	1.64064	31.035	1.57193	27.897	1.51047	25.101	1.45568	22.604	1.40695	20.372
0.8	1.79004	26.572	1.69780	23.753	1.61722	21.276	1.54680	19.090	1.48519	17.153
0.85	1.93206	21.122	1.81438	18.773	1.71398	16.739	1.62793	14.966	1.55384	13.409
0.9	2.05254	14.732	1.91081	13.027	1.79243	11.570	1.69266	10.312	1.60788	9.217
0.95	2.13465	7.582	1.97520	6.680	1.84400	5.917	1.73467	5.263	1.64262	4.696
1.0	2.16395	**0.00**	1.99792	**0.00**	1.86202	**0.00**	1.74926	**0.00**	1.65462	**0.00**
1.05	2.13465	**7.582**	1.97520	**6.680**	1.84400	**5.917**	1.73467	**5.263**	1.64262	**4.696**
1.1	2.05254	**14.732**	1.91081	**13.027**	1.79243	**11.570**	1.69266	**10.312**	1.60788	**9.217**
1.15	1.93206	**21.122**	1.81438	**18.773**	1.71398	**16.739**	1.62793	**14.966**	1.55384	**13.409**
1.2	1.79004	**26.572**	1.69780	**23.753**	1.61722	**21.276**	1.54680	**19.090**	1.48519	**17.153**
1.25	1.64064	**31.035**	1.57193	**27.897**	1.51047	**25.101**	1.45568	**22.604**	1.40695	**20.372**
1.3	1.49352	**34.544**	1.44490	**31.204**	1.40047	**28.190**	1.36012	**25.471**	1.32366	**23.017**
1.35	1.35414	**37.169**	1.32197	**33.707**	1.29201	**30.553**	1.26434	**27.683**	1.23898	**25.074**
1.4	1.22508	**38.983**	1.20607	**35.453**	1.18810	**32.214**	1.17128	**29.248**	1.15566	**26.539**
1.45	1.10708	**40.046**	1.09860	**36.482**	1.09048	**33.198**	1.08279	**30.180**	1.07558	**27.414**
1.5	1.00000	**40.395**	1.00000	**36.822**	1.00000	**33.524**	1.00000	**30.489**	1.00000	**27.705**
1.55	0.90328	**40.046**	0.91025	**36.482**	0.91703	**33.198**	0.92354	**30.180**	0.92973	**27.414**
1.6	0.81628	**38.983**	0.82914	**35.453**	0.84168	**32.214**	0.85377	**29.248**	0.86531	**26.539**
1.65	0.73847	**37.169**	0.75645	**33.707**	0.77399	**30.553**	0.79092	**27.683**	0.80711	**25.074**
1.7	0.66956	**34.544**	0.69209	**31.204**	0.71405	**28.190**	0.73523	**25.471**	0.75548	**23.017**
1.75	0.60952	**31.035**	0.63616	**27.897**	0.66205	**25.101**	0.68696	**22.604**	0.71076	**20.372**
1.8	0.55865	**26.572**	0.58900	**23.753**	0.61835	**21.276**	0.64650	**19.090**	0.67331	**17.153**
1.85	0.51758	**21.122**	0.55115	**18.773**	0.58344	**16.739**	0.61428	**14.966**	0.64357	**13.409**
1.9	0.48720	**14.732**	0.52334	**13.027**	0.55790	**11.570**	0.59079	**10.312**	0.62194	**9.217**
1.95	0.46846	**7.582**	0.50628	**6.680**	0.54230	**5.917**	0.57648	**5.263**	0.60878	**4.696**
2.0	0.46211	**0.00**	0.50052	**0.00**	0.53704	**0.00**	0.57167	**0.00**	0.60437	**0.00**

Note. Negative quantities are in heavy type.

Examples. tanh $(0.7 + i\,\underline{0.7}) = 1.32366 \angle 23^\circ.017 = 1.32366 \angle 23^\circ.01'.01''$.

tanh $(0.6 + i\,\underline{1.5}) = 1.0000 \overline{\backslash 33^\circ.524} = 1.0000 \overline{\backslash 33^\circ.31'.26''}$.

	$x = 0.75$		$x = 0.8$		$x = 0.85$		$x = 0.9$		$x = 0.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.63515	0.00	0.66403	0.00	0.69107	0.00	0.71629	0.00	0.73978	0.00
0.05	0.63921	4.202	0.66777	3.767	0.69451	3.384	0.71947	3.043	0.74269	2.741
0.1	0.65131	8.257	0.67892	7.411	0.70478	6.662	0.72892	5.995	0.75141	5.401
0.15	0.67125	12.036	0.69730	10.819	0.72172	9.737	0.74453	8.771	0.76578	7.909
0.2	0.69871	15.432	0.72264	13.898	0.74509	12.526	0.76607	11.297	0.78561	10.196
0.25	0.73333	18.371	0.75461	16.576	0.77459	14.964	0.79326	13.513	0.81065	12.208
0.3	0.77471	20.804	0.79285	18.807	0.80986	17.004	0.82576	15.375	0.84054	13.904
0.35	0.82247	22.707	0.83695	20.559	0.85051	18.613	0.86316	16.848	0.87492	15.250
0.4	0.87623	24.068	0.88650	21.819	0.89611	19.773	0.90504	17.914	0.91333	16.226
0.45	0.93557	24.885	0.94104	22.576	0.94614	20.472	0.95086	18.557	0.95523	16.816
0.5	1.00000	25.157	1.00000	22.828	1.00000	20.706	1.00000	18.772	1.00000	17.013
0.55	1.06887	24.885	1.06265	22.576	1.05693	20.472	1.05168	18.557	1.04687	16.816
0.6	1.14125	24.068	1.12803	21.819	1.11594	19.773	1.10492	17.914	1.09490	16.226
0.65	1.21585	22.707	1.19482	20.559	1.17576	18.613	1.15853	16.848	1.14297	15.250
0.7	1.29081	20.804	1.26128	18.807	1.23478	17.004	1.21101	15.375	1.18971	13.904
0.75	1.36365	18.371	1.32519	16.576	1.29101	14.964	1.26062	13.513	1.23358	12.208
0.8	1.43121	15.432	1.38382	13.898	1.34212	12.526	1.30536	11.297	1.27289	10.196
0.85	1.48976	12.036	1.43411	10.819	1.38559	9.737	1.34313	8.771	1.30586	7.909
0.9	1.53537	8.257	1.47293	7.411	1.41889	6.662	1.37189	5.995	1.33083	5.401
0.95	1.56444	4.202	1.49751	3.767	1.43986	3.384	1.38992	3.043	1.34645	2.741
1.0	1.57443	**0.00**	1.50594	**0.00**	1.44703	**0.00**	1.39606	**0.00**	1.35175	**0.00**
1.05	1.56444	**4.202**	1.49751	**3.767**	1.43986	**3.384**	1.38992	**3.043**	1.34645	**2.741**
1.1	1.53537	**8.257**	1.47293	**7.411**	1.41889	**6.662**	1.37189	**5.995**	1.33083	**5.401**
1.15	1.48976	**12.036**	1.43411	**10.819**	1.38559	**9.737**	1.34313	**8.771**	1.30586	**7.909**
1.2	1.43121	**15.432**	1.38382	**13.898**	1.34212	**12.526**	1.30536	**11.297**	1.27289	**10.196**
1.25	1.36365	**18.371**	1.32519	**16.576**	1.29101	**14.964**	1.26062	**13.513**	1.23358	**12.208**
1.3	1.29081	**20.804**	1.26128	**18.807**	1.23478	**17.004**	1.21101	**15.375**	1.18971	**13.904**
1.35	1.21585	**22.707**	1.19482	**20.559**	1.17576	**18.613**	1.15853	**16.848**	1.14297	**15.250**
1.4	1.14125	**24.068**	1.12803	**21.819**	1.11594	**19.773**	1.10492	**17.914**	1.09490	**16.226**
1.45	1.06887	**24.885**	1.06265	**22.576**	1.05693	**20.472**	1.05168	**18.557**	1.04687	**16.816**
1.5	1.00000	**25.157**	1.00000	**22.828**	1.00000	**20.706**	1.00000	**18.772**	1.00000	**17.013**
1.55	0.93557	**24.885**	0.94104	**22.576**	0.94614	**20.472**	0.95086	**18.557**	0.95523	**16.816**
1.6	0.87623	**24.068**	0.88650	**21.819**	0.89611	**19.773**	0.90504	**17.914**	0.91333	**16.226**
1.65	0.82247	**22.707**	0.83695	**20.559**	0.85051	**18.613**	0.86316	**16.848**	0.87492	**15.250**
1.7	0.77471	**20.804**	0.79285	**18.807**	0.80986	**17.004**	0.82576	**15.375**	0.84054	**13.904**
1.75	0.73333	**18.371**	0.75461	**16.576**	0.77459	**14.964**	0.79326	**13.513**	0.81065	**12.208**
1.8	0.69871	**15.432**	0.72264	**13.898**	0.74509	**12.526**	0.76607	**11.297**	0.78561	**10.196**
1.85	0.67125	**12.036**	0.69730	**10.819**	0.72172	**9.737**	0.74453	**8.771**	0.76578	**7.909**
1.9	0.65131	**8.257**	0.67892	**7.411**	0.70478	**6.662**	0.72892	**5.995**	0.75141	**5.401**
1.95	0.63921	**4.202**	0.66777	**3.767**	0.69451	**3.384**	0.71947	**3.043**	0.74269	**2.741**
2.0	0.63515	**0.00**	0.66403	**0.00**	0.69107	**0.00**	0.71629	**0.00**	0.73978	**0.00**

Note. Negative quantities are in heavy type.

Examples. tanh $(0.9 + i\,\underline{1.0}) = 1.39606\ \underline{/0^\circ}$.

tanh $(0.95 + i\,\underline{1.55}) = 0.95523\ \overline{\backslash 16^\circ.816} = 0.95523\ \overline{\backslash 16^\circ.48'.58''}$.

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \underline{/\gamma}$. CONTINUED

q	$x = 1.0$ r	γ °	$x = 1.05$ r	γ °	$x = 1.1$ r	γ °	$x = 1.15$ r	γ °	$x = 1.2$ r	γ °
0	0.76159	0.00	0.78181	0.00	0.80050	0.00	0.81775	0.00	0.83365	0.00
0.05	0.76428	2.470	0.78427	2.228	0.80277	2.010	0.81984	1.815	0.83557	1.639
0.1	0.77229	4.870	0.79164	4.394	0.80954	3.966	0.82605	3.582	0.84127	3.235
0.15	0.78552	7.134	0.80380	6.440	0.82071	5.815	0.83630	5.254	0.85067	4.747
0.2	0.80376	9.206	0.82058	8.315	0.83611	7.513	0.85043	6.790	0.86361	6.138
0.25	0.82678	11.032	0.84172	9.971	0.85551	9.015	0.86822	8.151	0.87991	7.371
0.3	0.85425	12.575	0.86693	11.373	0.87862	10.288	0.88939	9.306	0.89927	8.419
0.35	0.88580	13.802	0.89585	12.492	0.90509	11.305	0.91359	10.231	0.92138	9.258
0.4	0.92098	14.694	0.92802	13.305	0.93449	12.045	0.94042	10.904	0.94585	9.870
0.45	0.95925	15.233	0.96294	13.798	0.96632	12.495	0.96941	11.313	0.97223	10.242
0.5	1.00000	15.414	1.00000	13.963	1.00000	12.646	1.00000	11.451	1.00000	10.368
0.55	1.04248	15.233	1.03849	13.798	1.03486	12.495	1.03155	11.313	1.02854	10.242
0.6	1.08581	14.694	1.07756	13.305	1.07010	12.045	1.06335	10.904	1.05725	9.870
0.65	1.12892	13.802	1.11626	12.492	1.10486	11.305	1.09458	10.231	1.08533	9.258
0.7	1.17061	12.575	1.15349	11.373	1.13815	10.288	1.12437	9.306	1.11201	8.419
0.75	1.20951	11.032	1.18804	9.971	1.16889	9.015	1.15179	8.151	1.13649	7.371
0.8	1.24415	9.206	1.21866	8.315	1.19602	7.513	1.17587	6.790	1.15793	6.138
0.85	1.27305	7.134	1.24409	6.440	1.21846	5.815	1.19574	5.254	1.17555	4.747
0.9	1.29485	4.870	1.26320	4.394	1.23527	3.966	1.21058	3.582	1.18868	3.235
0.95	1.30843	2.470	1.27506	2.228	1.24569	2.010	1.21976	1.815	1.19680	1.639
1.0	1.31304	**0.00**	1.27908	**0.00**	1.24922	**0.00**	1.22286	**0.00**	1.19954	**0.00**
1.05	1.30843	**2.470**	1.27506	**2.228**	1.24569	**2.010**	1.21976	**1.815**	1.19680	**1.639**
1.1	1.29485	**4.870**	1.26320	**4.394**	1.23527	**3.966**	1.21058	**3.582**	1.18868	**3.235**
1.15	1.27305	**7.134**	1.24409	**6.440**	1.21846	**5.815**	1.19574	**5.254**	1.17555	**4.747**
1.2	1.24415	**9.206**	1.21866	**8.315**	1.19602	**7.513**	1.17587	**6.790**	1.15793	**6.138**
1.25	1.20951	**11.032**	1.18804	**9.971**	1.16889	**9.015**	1.15179	**8.151**	1.13649	**7.371**
1.3	1.17061	**12.575**	1.15349	**11.373**	1.13815	**10.288**	1.12437	**9.306**	1.11201	**8.419**
1.35	1.12892	**13.802**	1.11626	**12.492**	1.10486	**11.305**	1.09458	**10.231**	1.08533	**9.258**
1.4	1.08581	**14.694**	1.07756	**13.305**	1.07010	**12.045**	1.06335	**10.904**	1.05725	**9.870**
1.45	1.04248	**15.233**	1.03849	**13.798**	1.03486	**12.495**	1.03155	**11.313**	1.02854	**10.242**
1.5	1.00000	**15.414**	1.00000	**13.963**	1.00000	**12.646**	1.00000	**11.451**	1.00000	**10.368**
1.55	0.95925	**15.233**	0.96294	**13.798**	0.96632	**12.495**	0.96941	**11.313**	0.97223	**10.242**
1.6	0.92098	**14.694**	0.92802	**13.305**	0.93449	**12.045**	0.94042	**10.904**	0.94585	**9.870**
1.65	0.88580	**13.802**	0.89585	**12.492**	0.90509	**11.305**	0.91359	**10.231**	0.92138	**9.258**
1.7	0.85425	**12.575**	0.86693	**11.373**	0.87862	**10.288**	0.88939	**9.306**	0.89927	**8.419**
1.75	0.82678	**11.032**	0.84172	**9.971**	0.85551	**9.015**	0.86822	**8.151**	0.87991	**7.371**
1.8	0.80376	**9.206**	0.82058	**8.315**	0.83611	**7.513**	0.85043	**6.790**	0.86361	**6.138**
1.85	0.78552	**7.134**	0.80380	**6.440**	0.82071	**5.815**	0.83630	**5.254**	0.85067	**4.747**
1.9	0.77229	**4.870**	0.79164	**4.394**	0.80954	**3.966**	0.82605	**3.582**	0.84127	**3.235**
1.95	0.76428	**2.470**	0.78427	**2.228**	0.80277	**2.010**	0.81984	**1.815**	0.83557	**1.639**
2.0	0.76159	**0.00**	0.78181	**0.00**	0.80050	**0.00**	0.81775	**0.00**	0.83365	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.1 + i\,\underline{0.7}) = 1.13815\ \underline{/10^\circ.288} = 1.13815\ \underline{/10^\circ.17'.17''}$.

$\tanh(1.2 + i\,\underline{1.7}) = 0.89927\ \overline{\backslash 8^\circ.419} = 0.89927\ \overline{\backslash 8^\circ.25'.08''}$.

	$x = 1.25$		$x = 1.3$		$x = 1.35$		$x = 1.4$		$x = 1.45$	
q	r	γ °	r	γ °	r	γ °	r	γ °	r	γ °
0	0.84828	0.00	0.86172	0.00	0.87405	0.00	0.88535	0.00	0.89569	0.00
0.05	0.85004	1.481	0.86333	1.338	0.87552	1.210	0.88669	1.094	0.89692	0.989
0.1	0.85526	2.924	0.86811	2.643	0.87990	2.389	0.89069	2.161	0.90057	1.953
0.15	0.86387	4.291	0.87599	3.879	0.88711	3.508	0.89728	3.172	0.90659	2.869
0.2	0.87573	5.549	0.88684	5.017	0.89702	4.538	0.90634	4.104	0.91485	3.712
0.25	0.89063	6.666	0.90047	6.029	0.90947	5.454	0.91769	4.934	0.92521	4.463
0.3	0.90833	7.616	0.91663	6.890	0.92421	6.234	0.93114	5.640	0.93746	5.103
0.35	0.92852	8.378	0.93504	7.581	0.94099	6.860	0.94642	6.207	0.95137	5.617
0.4	0.95082	8.933	0.95534	8.085	0.95947	7.317	0.96323	6.622	0.96665	5.993
0.45	0.97481	9.272	0.97715	8.393	0.97928	7.596	0.98122	6.875	0.98298	6.222
0.5	1.00000	9.385	1.00000	8.496	1.00000	7.689	1.00000	6.960	1.00000	6.299
0.55	1.02584	9.272	1.02338	8.393	1.02116	7.596	1.01914	6.875	1.01733	6.222
0.6	1.05173	8.933	1.04674	8.085	1.04224	7.317	1.03817	6.622	1.03450	5.993
0.65	1.07699	8.378	1.06948	7.581	1.06271	6.860	1.05661	6.207	1.05112	5.617
0.7	1.10092	7.616	1.09096	6.890	1.08200	6.234	1.07395	5.640	1.06671	5.103
0.75	1.12280	6.666	1.11054	6.029	1.09955	5.454	1.08963	4.934	1.08084	4.463
0.8	1.14192	5.549	1.12760	5.017	1.11483	4.538	1.10335	4.104	1.09308	3.712
0.85	1.15758	4.291	1.14156	3.879	1.12726	3.508	1.11448	3.172	1.10304	2.869
0.9	1.16924	2.924	1.15193	2.643	1.13650	2.389	1.12272	2.161	1.11041	1.953
0.95	1.17642	1.481	1.15831	1.338	1.14218	1.210	1.12779	1.094	1.11493	0.989
1.0	1.17885	**0.00**	1.16047	**0.00**	1.14410	**0.00**	1.12950	**0.00**	1.11646	**0.00**
1.05	1.17642	**1.481**	1.15831	**1.338**	1.14218	**1.210**	1.12779	**1.094**	1.11493	**0.989**
1.1	1.16924	**2.924**	1.15193	**2.643**	1.13650	**2.389**	1.12272	**2.161**	1.11041	**1.953**
1.15	1.15758	**4.291**	1.14156	**3.879**	1.12726	**3.508**	1.11448	**3.172**	1.10304	**2.869**
1.2	1.14192	**5.549**	1.12760	**5.017**	1.11483	**4.538**	1.10335	**4.104**	1.09308	**3.712**
1.25	1.12280	**6.666**	1.11054	**6.029**	1.09955	**5.454**	1.08963	**4.934**	1.08084	**4.463**
1.3	1.10092	**7.616**	1.09096	**6.890**	1.08200	**6.234**	1.07395	**5.640**	1.06671	**5.103**
1.35	1.07699	**8.378**	1.06948	**7.581**	1.06271	**6.860**	1.05661	**6.207**	1.05112	**5.617**
1.4	1.05173	**8.933**	1.04674	**8.085**	1.04224	**7.317**	1.03817	**6.622**	1.03450	**5.993**
1.45	1.02584	**9.272**	1.02338	**8.393**	1.02116	**7.596**	1.01914	**6.875**	1.01733	**6.222**
1.5	1.00000	**9.385**	1.00000	**8.496**	1.00000	**7.689**	1.00000	**6.960**	1.00000	**6.299**
1.55	0.97481	**9.272**	0.97715	**8.393**	0.97928	**7.596**	0.98122	**6.875**	0.98298	**6.222**
1.6	0.95082	**8.933**	0.95534	**8.085**	0.95947	**7.317**	0.96323	**6.622**	0.96665	**5.993**
1.65	0.92852	**8.378**	0.93504	**7.581**	0.94099	**6.860**	0.94642	**6.207**	0.95137	**5.617**
1.7	0.90833	**7.616**	0.91663	**6.890**	0.92421	**6.234**	0.93114	**5.640**	0.93746	**5.103**
1.75	0.89063	**6.666**	0.90047	**6.029**	0.90947	**5.454**	0.91769	**4.934**	0.92521	**4.463**
1.8	0.87573	**5.549**	0.88684	**5.017**	0.89702	**4.538**	0.90634	**4.104**	0.91485	**3.712**
1.85	0.86387	**4.291**	0.87599	**3.879**	0.88711	**3.508**	0.89728	**3.172**	0.90659	**2.869**
1.9	0.85526	**2.924**	0.86811	**2.643**	0.87990	**2.389**	0.89069	**2.161**	0.90057	**1.953**
1.95	0.85004	**1.481**	0.86333	**1.338**	0.87552	**1.210**	0.88669	**1.094**	0.89692	**0.989**
2.0	0.84828	**0.00**	0.86172	**0.00**	0.87405	**0.00**	0.88535	**0.00**	0.89569	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.25 + i\,\underline{0.25}) = 0.89063 \underline{/6^\circ.666} = 0.89063 \underline{/6^\circ.39'.58''}.$

$\tanh(1.25 + i\,\underline{1.25}) = 1.12280 \overline{\backslash 6^\circ.666} = 1.12280 \overline{\backslash 6^\circ.39'.58''}.$

	x = 1.5		x = 1.55		x = 1.6		x = 1.65		x = 1.7	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.90515	0.00	0.91379	0.00	0.92167	0.00	0.92886	0.00	0.93541	0.00
0.05	0.90627	0.894	0.91481	0.809	0.92260	0.732	0.92970	0.662	0.93618	0.599
0.1	0.90960	1.767	0.91785	1.598	0.92537	1.446	0.93223	1.308	0.93848	1.183
0.15	0.91509	2.595	0.92285	2.347	0.92993	2.123	0.93638	1.921	0.94226	1.738
0.2	0.92263	3.357	0.92972	3.038	0.93619	2.748	0.94207	2.486	0.94744	2.249
0.25	0.93207	4.038	0.93832	3.653	0.94401	3.305	0.94920	2.990	0.95392	2.705
0.3	0.94323	4.617	0.94847	4.177	0.95325	3.780	0.95760	3.420	0.96155	3.095
0.35	0.95588	5.083	0.95998	4.599	0.96371	4.161	0.96710	3.766	0.97018	3.407
0.4	0.96976	5.423	0.97259	4.908	0.97516	4.440	0.97749	4.019	0.97961	3.636
0.45	0.98458	5.631	0.98603	5.096	0.98735	4.611	0.98854	4.173	0.98962	3.776
0.5	1.00000	5.700	1.00000	5.159	1.00000	4.668	1.00000	4.225	1.00000	3.822
0.55	1.01566	5.631	1.01417	5.096	1.01281	4.611	1.01159	4.173	1.01049	3.776
0.6	1.03118	5.423	1.02818	4.908	1.02548	4.440	1.02303	4.019	1.02082	3.636
0.65	1.04616	5.083	1.04169	4.599	1.03766	4.161	1.03402	3.766	1.03074	3.407
0.7	1.06019	4.617	1.05433	4.177	1.04904	3.780	1.04428	3.420	1.03999	3.095
0.75	1.07289	4.038	1.06574	3.653	1.05931	3.305	1.05353	2.990	1.04831	2.705
0.8	1.08386	3.357	1.07559	3.038	1.06817	2.748	1.06149	2.486	1.05548	2.249
0.85	1.09279	2.595	1.08360	2.347	1.07535	2.123	1.06795	1.921	1.06128	1.738
0.9	1.09938	1.767	1.08951	1.598	1.08065	1.446	1.07270	1.308	1.06556	1.183
0.95	1.10343	0.894	1.09313	0.809	1.08390	0.732	1.07562	0.662	1.06817	0.599
1.0	1.10479	**0.00**	1.09436	**0.00**	1.08500	**0.00**	1.07659	**0.00**	1.06906	**0.00**
1.05	1.10343	**0.894**	1.09313	**0.809**	1.08390	**0.732**	1.07562	**0.662**	1.06817	**0.599**
1.1	1.09938	**1.767**	1.08951	**1.598**	1.08065	**1.446**	1.07270	**1.308**	1.06556	**1.183**
1.15	1.09279	**2.595**	1.08360	**2.347**	1.07535	**2.123**	1.06795	**1.921**	1.06128	**1.738**
1.2	1.08386	**3.357**	1.07559	**3.038**	1.06817	**2.748**	1.06149	**2.486**	1.05548	**2.249**
1.25	1.07289	**4.038**	1.06574	**3.653**	1.05931	**3.305**	1.05353	**2.990**	1.04831	**2.705**
1.3	1.06019	**4.617**	1.05433	**4.177**	1.04904	**3.780**	1.04428	**3.420**	1.03999	**3.095**
1.35	1.04616	**5.083**	1.04169	**4.599**	1.03766	**4.161**	1.03402	**3.766**	1.03074	**3.407**
1.4	1.03118	**5.423**	1.02818	**4.908**	1.02548	**4.440**	1.02303	**4.019**	1.02082	**3.636**
1.45	1.01566	**5.631**	1.01417	**5.096**	1.01281	**4.611**	1.01159	**4.173**	1.01049	**3.776**
1.5	1.00000	**5.700**	1.00000	**5.159**	1.00000	**4.668**	1.00000	**4.225**	1.00000	**3.822**
1.55	0.98458	**5.631**	0.98603	**5.096**	0.98735	**4.611**	0.98854	**4.173**	0.98962	**3.776**
1.6	0.96976	**5.423**	0.97259	**4.908**	0.97516	**4.440**	0.97749	**4.019**	0.97961	**3.636**
1.65	0.95588	**5.083**	0.95998	**4.599**	0.96371	**4.161**	0.96710	**3.766**	0.97018	**3.407**
1.7	0.94323	**4.617**	0.94847	**4.177**	0.95325	**3.780**	0.95760	**3.420**	0.96155	**3.095**
1.75	0.93207	**4.038**	0.93832	**3.653**	0.94401	**3.305**	0.94920	**2.990**	0.95392	**2.705**
1.8	0.92263	**3.357**	0.92972	**3.038**	0.93619	**2.748**	0.94207	**2.486**	0.94744	**2.249**
1.85	0.91509	**2.595**	0.92285	**2.347**	0.92993	**2.123**	0.93638	**1.921**	0.94226	**1.738**
1.9	0.90960	**1.767**	0.91785	**1.598**	0.92537	**1.446**	0.93223	**1.308**	0.93848	**1.183**
1.95	0.90627	**0.894**	0.91481	**0.809**	0.92260	**0.732**	0.92970	**0.662**	0.93618	**0.599**
2.0	0.90515	**0.00**	0.91379	**0.00**	0.92167	**0.00**	0.92886	**0.00**	0.93541	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.7 + i\,\underline{0.7}) = 1.03999\,\underline{/3^\circ.095} = 1.03999\,\underline{/3^\circ.05'.42''}$.
$\tanh(1.6 + i\,\underline{1.7}) = 0.95325\,\overline{\diagdown 3^\circ.780} = 0.95325\,\overline{\diagdown 3^\circ.46'.48''}$.

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 1.75$		$x = 1.8$		$x = 1.85$		$x = 1.9$		$x = 1.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.94138	0.00	0.94681	0.00	0.95175	0.00	0.95624	0.00	0.96032	0.00
0.05	0.94208	0.542	0.94745	0.490	0.95232	0.443	0.95677	0.401	0.96080	0.363
0.1	0.94417	1.070	0.94935	0.968	0.95406	0.876	0.95834	0.793	0.96222	0.717
0.15	0.94761	1.572	0.95247	1.422	0.95690	1.287	0.96092	1.165	0.96457	1.053
0.2	0.95232	2.035	0.95676	1.841	0.96079	1.666	0.96445	1.507	0.96778	1.364
0.25	0.95821	2.448	0.96211	2.215	0.96565	2.004	0.96886	1.813	0.97178	1.640
0.3	0.96514	2.800	0.96840	2.533	0.97136	2.292	0.97405	2.074	0.97649	1.877
0.35	0.97297	3.083	0.97551	2.789	0.97781	2.524	0.97990	2.285	0.98179	2.067
0.4	0.98153	3.291	0.98327	2.977	0.98485	2.694	0.98628	2.438	0.98757	2.206
0.45	0.99061	3.417	0.99149	3.092	0.99230	2.798	0.99303	2.531	0.99369	2.291
0.5	1.00000	3.459	1.00000	3.130	1.00000	2.833	1.00000	2.562	1.00000	2.319
0.55	1.00948	3.417	1.00858	3.092	1.00776	2.798	1.00702	2.531	1.00635	2.291
0.6	1.01882	3.291	1.01702	2.977	1.01539	2.694	1.01392	2.438	1.01258	2.206
0.65	1.02778	3.083	1.02511	2.789	1.02269	2.524	1.02051	2.285	1.01854	2.067
0.7	1.03612	2.800	1.03263	2.533	1.02948	2.292	1.02664	2.074	1.02408	1.877
0.75	1.04362	2.448	1.03939	2.215	1.03558	2.004	1.03214	1.813	1.02904	1.640
0.8	1.05007	2.035	1.04520	1.841	1.04081	1.666	1.03686	1.507	1.03329	1.364
0.85	1.05529	1.572	1.04990	1.422	1.04504	1.287	1.04067	1.165	1.03673	1.053
0.9	1.05913	1.070	1.05336	0.968	1.04816	0.876	1.04347	0.793	1.03926	0.717
0.95	1.06148	0.542	1.05547	0.490	1.05006	0.443	1.04519	0.401	1.04080	0.363
1.0	1.06228	**0.00**	1.05619	**0.00**	1.05070	**0.00**	1.04576	**0.00**	1.04131	**0.00**
1.05	1.06148	**0.542**	1.05547	**0.490**	1.05006	**0.443**	1.04519	**0.401**	1.04080	**0.363**
1.1	1.05913	**1.070**	1.05336	**0.968**	1.04816	**0.876**	1.04347	**0.793**	1.03926	**0.717**
1.15	1.05529	**1.572**	1.04990	**1.422**	1.04504	**1.287**	1.04067	**1.165**	1.03673	**1.053**
1.2	1.05007	**2.035**	1.04520	**1.841**	1.04081	**1.666**	1.03686	**1.507**	1.03329	**1.364**
1.25	1.04362	**2.448**	1.03939	**2.215**	1.03558	**2.004**	1.03214	**1.813**	1.02904	**1.640**
1.3	1.03612	**2.800**	1.03263	**2.533**	1.02948	**2.292**	1.02664	**2.074**	1.02408	**1.877**
1.35	1.02778	**3.083**	1.02511	**2.789**	1.02269	**2.524**	1.02051	**2.285**	1.01854	**2.067**
1.4	1.01882	**3.291**	1.01702	**2.977**	1.01539	**2.694**	1.01392	**2.438**	1.01258	**2.206**
1.45	1.00948	**3.417**	1.00858	**3.092**	1.00776	**2.798**	1.00702	**2.531**	1.00635	**2.291**
1.5	1.00000	**3.459**	1.00000	**3.130**	1.00000	**2.833**	1.00000	**2.562**	1.00000	**2.319**
1.55	0.99061	**3.417**	0.99149	**3.092**	0.99230	**2.798**	0.99303	**2.531**	0.99369	**2.291**
1.6	0.98153	**3.291**	0.98327	**2.977**	0.98485	**2.694**	0.98628	**2.438**	0.98757	**2.206**
1.65	0.97297	**3.083**	0.97551	**2.789**	0.97781	**2.524**	0.97990	**2.285**	0.98179	**2.067**
1.7	0.96514	**2.800**	0.96840	**2.533**	0.97136	**2.292**	0.97405	**2.074**	0.97649	**1.877**
1.75	0.95821	**2.448**	0.96211	**2.215**	0.96565	**2.004**	0.96886	**1.813**	0.97178	**1.640**
1.8	0.95232	**2.035**	0.95676	**1.841**	0.96079	**1.666**	0.96445	**1.507**	0.96778	**1.364**
1.85	0.94761	**1.572**	0.95247	**1.422**	0.95690	**1.287**	0.96092	**1.165**	0.96457	**1.053**
1.9	0.94417	**1.070**	0.94935	**0.968**	0.95406	**0.876**	0.95834	**0.793**	0.96222	**0.717**
1.95	0.94208	**0.542**	0.94745	**0.490**	0.95232	**0.443**	0.95677	**0.401**	0.96080	**0.363**
2.0	0.94138	**0.00**	0.94681	**0.00**	0.95175	**0.00**	0.95624	**0.00**	0.96032	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(1.9 + i\,\underline{0.05}) = 0.95677\ \underline{/0^\circ.401} = 0.95677\ \underline{/0^\circ.24'.04''}$.

$\tanh(1.95 + i\,\underline{1.5}) = 1.000\ \overline{\backslash 2^\circ.319} = 1.000\ \overline{\backslash 2^\circ.19'.08''}$.

Table XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r\underline{/\gamma}$. Continued

	$x = 2.0$		$x = 2.05$		$x = 2.1$		$x = 2.15$		$x = 2.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.96403	0.00	0.96740	0.00	0.97045	0.00	0.97323	0.00	0.97574	0.00
0.05	0.96446	0.328	0.96779	0.297	0.97081	0.268	0.97355	0.243	0.97604	0.220
0.1	0.96576	0.649	0.96897	0.587	0.97188	0.531	0.97452	0.481	0.97692	0.435
0.15	0.96789	0.953	0.97090	0.862	0.97363	0.780	0.97611	0.706	0.97842	0.639
0.2	0.97080	1.234	0.97354	1.117	0.97603	1.010	0.97829	0.914	0.98033	0.827
0.25	0.97443	1.484	0.97684	1.343	0.97902	1.215	0.98100	1.099	0.98279	0.995
0.3	0.97870	1.698	0.98071	1.537	0.98253	1.390	0.98418	1.258	0.98567	1.138
0.35	0.98351	1.870	0.98507	1.692	0.98648	1.531	0.98776	1.385	0.98892	1.253
0.4	0.98875	1.996	0.98981	1.806	0.99078	1.634	0.99165	1.479	0.99244	1.337
0.45	0.99429	2.072	0.99483	1.876	0.99532	1.698	0.99577	1.536	0.99617	1.389
0.5	1.00000	2.098	1.00000	1.899	1.00000	1.718	1.00000	1.555	1.00000	1.406
0.55	1.00574	2.072	1.00520	1.876	1.00470	1.698	1.00425	1.536	1.00385	1.389
0.6	1.01138	1.996	1.01029	1.806	1.00931	1.634	1.00842	1.479	1.00762	1.337
0.65	1.01676	1.870	1.01516	1.692	1.01371	1.531	1.01240	1.385	1.01121	1.253
0.7	1.02176	1.698	1.01967	1.537	1.01778	1.390	1.01608	1.258	1.01454	1.138
0.75	1.02624	1.484	1.02371	1.343	1.02143	1.215	1.01937	1.099	1.01751	0.995
0.8	1.03008	1.234	1.02718	1.117	1.02456	1.010	1.02220	0.914	1.02006	0.827
0.85	1.03318	0.953	1.02998	0.862	1.02708	0.780	1.02447	0.706	1.02206	0.639
0.9	1.03545	0.649	1.03203	0.587	1.02894	0.531	1.02614	0.481	1.02363	0.435
0.95	1.03685	0.328	1.03328	0.297	1.03007	0.268	1.02717	0.243	1.02455	0.220
1.0	1.03731	**0.00**	1.03370	**0.00**	1.03045	**0.00**	1.02751	**0.00**	1.02486	**0.00**
1.05	1.03685	**0.328**	1.03328	**0.297**	1.03007	**0.268**	1.02717	**0.243**	1.02455	**0.220**
1.1	1.03545	**0.649**	1.03202	**0.587**	1.02894	**0.531**	1.02614	**0.481**	1.02363	**0.435**
1.15	1.03318	**0.953**	1.02998	**0.862**	1.02708	**0.780**	1.02447	**0.706**	1.02206	**0.639**
1.2	1.03008	**1.234**	1.02718	**1.117**	1.02456	**1.010**	1.02220	**0.914**	1.02006	**0.827**
1.25	1.02624	**1.484**	1.02371	**1.343**	1.02143	**1.215**	1.01937	**1.099**	1.01751	**0.995**
1.3	1.02176	**1.698**	1.01967	**1.537**	1.01778	**1.390**	1.01608	**1.258**	1.01454	**1.138**
1.35	1.01676	**1.870**	1.01516	**1.692**	1.01371	**1.531**	1.01240	**1.385**	1.01121	**1.253**
1.4	1.01138	**1.996**	1.01029	**1.806**	1.00931	**1.634**	1.00842	**1.479**	1.00762	**1.337**
1.45	1.00574	**2.072**	1.00520	**1.876**	1.00470	**1.698**	1.00425	**1.536**	1.00385	**1.389**
1.5	1.00000	**2.098**	1.00000	**1.899**	1.00000	**1.718**	1.00000	**1.555**	1.00000	**1.406**
1.55	0.99429	**2.072**	0.99483	**1.876**	0.99532	**1.698**	0.99577	**1.536**	0.99617	**1.389**
1.6	0.98875	**1.996**	0.98981	**1.806**	0.99078	**1.634**	0.99165	**1.479**	0.99244	**1.337**
1.65	0.98351	**1.870**	0.98507	**1.692**	0.98648	**1.531**	0.98776	**1.385**	0.98892	**1.253**
1.7	0.97870	**1.698**	0.98071	**1.537**	0.98253	**1.390**	0.98418	**1.258**	0.98567	**1.138**
1.75	0.97443	**1.484**	0.97684	**1.343**	0.97902	**1.215**	0.98100	**1.099**	0.98279	**0.995**
1.8	0.97080	**1.234**	0.97354	**1.117**	0.97603	**1.010**	0.97829	**0.914**	0.98033	**0.827**
1.85	0.96789	**0.953**	0.97090	**0.862**	0.97363	**0.780**	0.97611	**0.706**	0.97842	**0.639**
1.9	0.96576	**0.649**	0.96897	**0.587**	0.97188	**0.531**	0.97452	**0.481**	0.97692	**0.435**
1.95	0.96446	**0.328**	0.96779	**0.297**	0.97081	**0.268**	0.97355	**0.243**	0.97604	**0.220**
2.0	0.96403	**0.00**	0.96740	**0.00**	0.97045	**0.00**	0.97323	**0.00**	0.97574	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.2 + i\,0) = 0.97574\,\underline{/0^\circ}.$

$\tanh(2.2 + i\,\underline{1.95}) = 0.97604\,\overline{\backslash 0^\circ.220} \doteq 0.97604\,\overline{\backslash 0^\circ.13'.12''}.$

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 2.25$		$x = 2.3$		$x = 2.35$		$x = 2.4$		$x = 2.45$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.97803	0.00	0.98010	0.00	0.98197	0.00	0.98367	0.00	0.98522	0.00
0.05	0.97829	0.199	0.98034	0.180	0.98219	0.163	0.98388	0.147	0.98540	0.134
0.1	0.97909	0.394	0.98106	0.356	0.98285	0.322	0.98447	0.291	0.98594	0.264
0.15	0.98040	0.578	0.98225	0.523	0.98393	0.473	0.98544	0.428	0.98682	0.388
0.2	0.98219	0.748	0.98387	0.677	0.98539	0.613	0.98677	0.554	0.98802	0.501
0.25	0.98441	0.900	0.98589	0.814	0.98722	0.737	0.98843	0.666	0.98953	0.603
0.3	0.98703	1.030	0.98825	0.932	0.98937	0.843	0.99037	0.763	0.99129	0.690
0.35	0.98997	1.134	0.99092	1.027	0.99178	0.929	0.99256	0.841	0.99326	0.760
0.4	0.99316	1.211	0.99381	1.095	0.99440	0.991	0.99493	0.896	0.99541	0.812
0.45	0.99653	1.257	0.99686	1.138	0.99716	1.030	0.99743	0.931	0.99767	0.843
0.5	1.00000	1.273	1.00000	1.152	1.00000	1.042	1.00000	0.942	1.00000	0.853
0.55	1.00348	1.257	1.00315	1.138	1.00285	1.030	1.00258	0.931	1.00233	0.843
0.6	1.00689	1.211	1.00623	1.095	1.00564	0.991	1.00510	0.896	1.00461	0.812
0.65	1.01014	1.134	1.00917	1.027	1.00829	0.929	1.00750	0.841	1.00678	0.760
0.7	1.01314	1.030	1.01189	0.932	1.01075	0.843	1.00972	0.763	1.00879	0.690
0.75	1.01583	0.900	1.01431	0.814	1.01295	0.737	1.01171	0.666	1.01058	0.603
0.8	1.01814	0.748	1.01640	0.677	1.01482	0.613	1.01340	0.554	1.01212	0.501
0.85	1.01999	0.578	1.01807	0.523	1.01634	0.473	1.01477	0.428	1.01336	0.388
0.9	1.02136	0.394	1.01930	0.356	1.01745	0.322	1.01578	0.291	1.01426	0.264
0.95	1.02219	0.199	1.02005	0.180	1.01813	0.163	1.01639	0.147	1.01482	0.134
1.0	1.02247	**0.00**	1.02031	**0.00**	1.01836	**0.00**	1.01659	**0.00**	1.01500	**0.00**
1.05	1.02219	**0.199**	1.02005	**0.180**	1.01813	**0.163**	1.01639	**0.147**	1.01482	**0.134**
1.1	1.02136	**0.394**	1.01930	**0.356**	1.01745	**0.322**	1.01578	**0.291**	1.01426	**0.264**
1.15	1.01999	**0.578**	1.01807	**0.523**	1.01634	**0.473**	1.01477	**0.428**	1.01336	**0.388**
1.2	1.01814	**0.748**	1.01640	**0.677**	1.01482	**0.613**	1.01340	**0.554**	1.01212	**0.501**
1.25	1.01583	**0.900**	1.01431	**0.814**	1.01295	**0.737**	1.01171	**0.666**	1.01058	**0.603**
1.3	1.01314	**1.030**	1.01189	**0.932**	1.01075	**0.843**	1.00972	**0.763**	1.00879	**0.690**
1.35	1.01014	**1.134**	1.00917	**1.027**	1.00829	**0.929**	1.00750	**0.841**	1.00678	**0.760**
1.4	1.00689	**1.211**	1.00623	**1.095**	1.00564	**0.991**	1.00510	**0.896**	1.00461	**0.812**
1.45	1.00348	**1.257**	1.00315	**1.138**	1.00285	**1.030**	1.00258	**0.931**	1.00233	**0.843**
1.5	1.00000	**1.273**	1.00000	**1.152**	1.00000	**1.042**	1.00000	**0.942**	1.00000	**0.853**
1.55	0.99653	**1.257**	0.99686	**1.138**	0.99716	**1.030**	0.99743	**0.931**	0.99767	**0.843**
1.6	0.99316	**1.211**	0.99381	**1.095**	0.99440	**0.991**	0.99493	**0.896**	0.99541	**0.812**
1.65	0.98997	**1.134**	0.99092	**1.027**	0.99178	**0.929**	0.99256	**0.841**	0.99326	**0.760**
1.7	0.98703	**1.030**	0.98825	**0.932**	0.98937	**0.843**	0.99037	**0.763**	0.99129	**0.690**
1.75	0.98441	**0.900**	0.98589	**0.814**	0.98722	**0.737**	0.98843	**0.666**	0.98953	**0.603**
1.8	0.98219	**0.748**	0.98387	**0.677**	0.98539	**0.613**	0.98677	**0.554**	0.98802	**0.501**
1.85	0.98040	**0.578**	0.98225	**0.523**	0.98393	**0.473**	0.98544	**0.428**	0.98682	**0.388**
1.9	0.97909	**0.394**	0.98106	**0.356**	0.98285	**0.322**	0.98447	**0.291**	0.98594	**0.264**
1.95	0.97829	**0.199**	0.98034	**0.180**	0.98219	**0.163**	0.98388	**0.147**	0.98540	**0.134**
2.0	0.97803	**0.00**	0.98010	**0.00**	0.98197	**0.00**	0.98367	**0.00**	0.98522	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.45 + i\,\underline{0.7}) = 1.00879 \underline{/0°.690} = 1.00879 \underline{/0°.41'.24''}$.

$\tanh(2.45 + i\,\underline{1.7}) = 0.99129 \overline{\backslash 0°.690} = 0.99129 \overline{\backslash 0°.41'.24''}$.

Table XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r\,\underline{/\gamma}$. Continued

	$x = 2.5$		$x = 2.55$		$x = 2.6$		$x = 2.65$		$x = 2.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.98661	0.00	0.98788	0.00	0.98903	0.00	0.99007	0.00	0.99101	0.00
0.05	0.98678	0.121	0.98803	0.109	0.98916	0.099	0.99019	0.089	0.99112	0.081
0.1	0.98727	0.239	0.98847	0.216	0.98956	0.195	0.99055	0.177	0.99145	0.160
0.15	0.98806	0.350	0.98919	0.317	0.99022	0.287	0.99114	0.260	0.99198	0.235
0.2	0.98916	0.454	0.99018	0.411	0.99111	0.372	0.99196	0.336	0.99272	0.304
0.25	0.99052	0.546	0.99142	0.494	0.99223	0.447	0.99297	0.405	0.99363	0.366
0.3	0.99211	0.625	0.99286	0.565	0.99354	0.512	0.99415	0.463	0.99471	0.419
0.35	0.99390	0.688	0.99448	0.623	0.99500	0.563	0.99548	0.510	0.99591	0.461
0.4	0.99584	0.734	0.99624	0.665	0.99660	0.601	0.99692	0.544	0.99721	0.492
0.45	0.99789	0.763	0.99809	0.690	0.99828	0.624	0.99844	0.565	0.99859	0.511
0.5	1.00000	0.772	1.00000	0.699	1.00000	0.632	1.00000	0.573	1.00000	0.518
0.55	1.00211	0.763	1.00191	0.690	1.00173	0.624	1.00156	0.565	1.00141	0.511
0.6	1.00417	0.734	1.00377	0.665	1.00342	0.601	1.00309	0.544	1.00280	0.492
0.65	1.00614	0.688	1.00555	0.623	1.00502	0.563	1.00454	0.510	1.00411	0.461
0.7	1.00795	0.625	1.00719	0.565	1.00651	0.512	1.00589	0.463	1.00532	0.419
0.75	1.00958	0.546	1.00866	0.494	1.00783	0.447	1.00708	0.405	1.00641	0.366
0.8	1.01096	0.454	1.00991	0.411	1.00897	0.372	1.00811	0.336	1.00733	0.304
0.85	1.01208	0.350	1.01092	0.317	1.00988	0.287	1.00894	0.260	1.00808	0.235
0.9	1.01290	0.239	1.01166	0.216	1.01055	0.195	1.00954	0.177	1.00863	0.160
0.95	1.01340	0.121	1.01212	0.109	1.01096	0.099	1.00991	0.089	1.00896	0.081
1.0	1.01357	**0.00**	1.01227	**0.00**	1.01110	**0.00**	1.01003	**0.00**	1.00907	**0.00**
1.05	1.01340	**0.121**	1.01212	**0.109**	1.01096	**0.099**	1.00991	**0.089**	1.00896	**0.081**
1.1	1.01290	**0.239**	1.01166	**0.216**	1.01055	**0.195**	1.00954	**0.177**	1.00863	**0.160**
1.15	1.01208	**0.350**	1.01092	**0.317**	1.00988	**0.287**	1.00894	**0.260**	1.00808	**0.235**
1.2	1.01096	**0.454**	1.00991	**0.411**	1.00897	**0.372**	1.00811	**0.336**	1.00733	**0.304**
1.25	1.00958	**0.546**	1.00866	**0.494**	1.00783	**0.447**	1.00708	**0.405**	1.00641	**0.366**
1.3	1.00795	**0.625**	1.00719	**0.565**	1.00651	**0.512**	1.00589	**0.463**	1.00532	**0.419**
1.35	1.00614	**0.688**	1.00555	**0.623**	1.00502	**0.563**	1.00454	**0.510**	1.00411	**0.461**
1.4	1.00417	**0.734**	1.00377	**0.665**	1.00342	**0.601**	1.00309	**0.544**	1.00280	**0.492**
1.45	1.00211	**0.763**	1.00191	**0.690**	1.00173	**0.624**	1.00156	**0.565**	1.00141	**0.511**
1.5	1.00000	**0.772**	1.00000	**0.699**	1.00000	**0.632**	1.00000	**0.573**	1.00000	**0.518**
1.55	0.99789	**0.763**	0.99809	**0.690**	0.99828	**0.624**	0.99844	**0.565**	0.99859	**0.511**
1.6	0.99584	**0.734**	0.99624	**0.665**	0.99660	**0.601**	0.99692	**0.544**	0.99721	**0.492**
1.65	0.99390	**0.688**	0.99448	**0.623**	0.99500	**0.563**	0.99548	**0.510**	0.99591	**0.461**
1.7	0.99211	**0.625**	0.99286	**0.565**	0.99354	**0.512**	0.99415	**0.463**	0.99471	**0.419**
1.75	0.99052	**0.546**	0.99142	**0.494**	0.99223	**0.447**	0.99297	**0.405**	0.99363	**0.366**
1.8	0.98916	**0.454**	0.99018	**0.411**	0.99111	**0.372**	0.99196	**0.336**	0.99272	**0.304**
1.85	0.98806	**0.350**	0.98919	**0.317**	0.99022	**0.287**	0.99114	**0.260**	0.99198	**0.235**
1.9	0.98727	**0.239**	0.98847	**0.216**	0.98956	**0.195**	0.99055	**0.177**	0.99145	**0.160**
1.95	0.98678	**0.121**	0.98803	**0.109**	0.98916	**0.099**	0.99019	**0.089**	0.99112	**0.081**
2.0	0.98661	**0.00**	0.98788	**0.00**	0.98903	**0.00**	0.99007	**0.00**	0.99101	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.5 + i\,\underline{0.25}) = 0.99052\,\underline{/0^\circ.546} = 0.99052\,\underline{/0^\circ.32'.46''}.$

$\tanh(2.5 + i\,\underline{1.75}) = 0.99052\,\overline{\backslash 0^\circ.546} = 0.99052\,\overline{\backslash 0^\circ.32'.46''}.$

	$x = 2.75$		$x = 2.8$		$x = 2.85$		$x = 2.9$		$x = 2.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.99186	0.00	0.99263	0.00	0.99333	0.00	0.99396	0.00	0.99454	0.00
0.05	0.99196	0.073	0.99272	0.066	0.99341	0.060	0.99404	0.054	0.99460	0.049
0.1	0.99226	0.145	0.99299	0.131	0.99366	0.119	0.99426	0.107	0.99480	0.097
0.15	0.99275	0.213	0.99343	0.192	0.99406	0.174	0.99462	0.158	0.99513	0.143
0.2	0.99341	0.275	0.99404	0.249	0.99460	0.226	0.99511	0.204	0.99558	0.184
0.25	0.99424	0.331	0.99478	0.300	0.99528	0.271	0.99573	0.245	0.99613	0.222
0.3	0.99521	0.379	0.99566	0.343	0.99607	0.310	0.99645	0.281	0.99679	0.254
0.35	0.99630	0.417	0.99665	0.378	0.99697	0.342	0.99726	0.309	0.99752	0.280
0.4	0.99748	0.446	0.99772	0.403	0.99793	0.365	0.99813	0.330	0.99831	0.299
0.45	0.99872	0.463	0.99884	0.419	0.99895	0.379	0.99905	0.343	0.99914	0.310
0.5	1.00000	0.468	1.00000	0.424	1.00000	0.383	1.00000	0.347	1.00000	0.313
0.55	1.00128	0.463	1.00116	0.419	1.00105	0.379	1.00095	0.343	1.00086	0.310
0.6	1.00253	0.446	1.00229	0.403	1.00207	0.365	1.00187	0.330	1.00169	0.299
0.65	1.00372	0.417	1.00336	0.378	1.00304	0.342	1.00275	0.309	1.00249	0.280
0.7	1.00482	0.379	1.00436	0.343	1.00394	0.310	1.00356	0.281	1.00323	0.254
0.75	1.00580	0.331	1.00524	0.300	1.00474	0.271	1.00429	0.245	1.00388	0.222
0.8	1.00664	0.275	1.00600	0.249	1.00543	0.226	1.00491	0.204	1.00444	0.184
0.85	1.00731	0.213	1.00661	0.192	1.00598	0.174	1.00541	0.158	1.00489	0.143
0.9	1.00780	0.145	1.00706	0.131	1.00638	0.119	1.00578	0.107	1.00522	0.097
0.95	1.00810	0.073	1.00733	0.066	1.00663	0.060	1.00600	0.054	1.00543	0.049
1.0	1.00821	**0.00**	1.00742	**0.00**	1.00671	**0.00**	1.00607	**0.00**	1.00549	**0.00**
1.05	1.00810	**0.073**	1.00733	**0.066**	1.00663	**0.060**	1.00600	**0.054**	1.00543	**0.049**
1.1	1.00780	**0.145**	1.00706	**0.131**	1.00638	**0.119**	1.00578	**0.107**	1.00522	**0.097**
1.15	1.00731	**0.213**	1.00661	**0.192**	1.00598	**0.174**	1.00541	**0.158**	1.00489	**0.143**
1.2	1.00664	**0.275**	1.00600	**0.249**	1.00543	**0.226**	1.00491	**0.204**	1.00444	**0.184**
1.25	1.00580	**0.331**	1.00524	**0.300**	1.00474	**0.271**	1.00429	**0.245**	1.00388	**0.222**
1.3	1.00482	**0.379**	1.00436	**0.343**	1.00394	**0.310**	1.00356	**0.281**	1.00323	**0.254**
1.35	1.00372	**0.417**	1.00336	**0.378**	1.00304	**0.342**	1.00275	**0.309**	1.00249	**0.280**
1.4	1.00253	**0.446**	1.00229	**0.403**	1.00207	**0.365**	1.00187	**0.330**	1.00169	**0.299**
1.45	1.00128	**0.463**	1.00116	**0.419**	1.00105	**0.379**	1.00095	**0.343**	1.00086	**0.310**
1.5	1.00000	**0.468**	1.00000	**0.424**	1.00000	**0.383**	1.00000	**0.347**	1.00000	**0.313**
1.55	0.99872	**0.463**	0.99884	**0.419**	0.99895	**0.379**	0.99905	**0.343**	0.99914	**0.310**
1.6	0.99748	**0.446**	0.99772	**0.403**	0.99793	**0.365**	0.99813	**0.330**	0.99831	**0.299**
1.65	0.99630	**0.417**	0.99665	**0.378**	0.99697	**0.342**	0.99726	**0.309**	0.99752	**0.280**
1.7	0.99521	**0.379**	0.99566	**0.343**	0.99607	**0.310**	0.99645	**0.281**	0.99679	**0.254**
1.75	0.99424	**0.331**	0.99478	**0.300**	0.99528	**0.271**	0.99573	**0.245**	0.99613	**0.222**
1.8	0.99341	**0.275**	0.99404	**0.249**	0.99460	**0.226**	0.99511	**0.204**	0.99558	**0.184**
1.85	0.99275	**0.213**	0.99343	**0.192**	0.99406	**0.174**	0.99462	**0.158**	0.99513	**0.143**
1.9	0.99226	**0.145**	0.99299	**0.131**	0.99366	**0.119**	0.99426	**0.107**	0.99480	**0.097**
1.95	0.99196	**0.073**	0.99272	**0.066**	0.99341	**0.060**	0.99404	**0.054**	0.99460	**0.049**
2.0	0.99186	**0.00**	0.99263	**0.00**	0.99333	**0.00**	0.99396	**0.00**	0.99454	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(2.9 + i\,\underline{0.5}) = 1.0000\,\underline{/0^\circ.347} = 1.0000\,\underline{/0^\circ.26'.49''}$.

$\tanh(2.95 + i\,\underline{1.75}) = 0.99613\,\overline{\backslash 0^\circ.222} = 0.99613\,\overline{\backslash 0^\circ.13'.19''}$.

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \underline{/\gamma}$. CONTINUED

	$x = 3.0$		$x = 3.05$		$x = 3.1$		$x = 3.15$		$x = 3.2$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.99505	0.00	0.99552	0.00	0.99595	0.00	0.99633	0.00	0.99668	0.00
0.05	0.99511	0.044	0.99558	0.040	0.99600	0.037	0.99638	0.033	0.99672	0.030
0.1	0.99530	0.088	0.99575	0.079	0.99615	0.072	0.99651	0.065	0.99685	0.059
0.15	0.99559	0.129	0.99601	0.117	0.99639	0.106	0.99673	0.096	0.99704	0.086
0.2	0.99600	0.167	0.99638	0.151	0.99672	0.137	0.99703	0.124	0.99732	0.112
0.25	0.99650	0.201	0.99683	0.182	0.99714	0.165	0.99741	0.149	0.99765	0.135
0.3	0.99709	0.229	0.99737	0.208	0.99762	0.188	0.99784	0.170	0.99805	0.154
0.35	0.99775	0.253	0.99797	0.229	0.99816	0.207	0.99833	0.188	0.99849	0.170
0.4	0.99847	0.270	0.99862	0.244	0.99875	0.221	0.99887	0.200	0.99897	0.181
0.45	0.99923	0.281	0.99930	0.254	0.99937	0.230	0.99943	0.208	0.99948	0.188
0.5	1.00000	0.284	1.00000	0.257	1.00000	0.233	1.00000	0.211	1.00000	0.191
0.55	1.00078	0.281	1.00070	0.254	1.00064	0.230	1.00058	0.208	1.00052	0.188
0.6	1.00153	0.270	1.00139	0.244	1.00125	0.221	1.00114	0.200	1.00103	0.181
0.65	1.00225	0.253	1.00204	0.229	1.00185	0.207	1.00167	0.188	1.00151	0.170
0.7	1.00292	0.229	1 00264	0.208	1.00239	0.188	1.00216	0.170	1.00196	0.154
0.75	1.00351	0.201	1.00318	0.182	1.00287	0.165	1.00260	0.149	1.00235	0.135
0.8	1.00402	0.167	1.00363	0.151	1.00329	0.137	1.00297	0.124	1.00269	0.112
0.85	1.00443	0.129	1.00400	0.117	1.00360	0.106	1.00328	0.096	1.00297	0.086
0.9	1.00473	0.088	1.00427	0.079	1.00387	0.072	1.00350	0.065	1.00316	0.059
0.95	1.00491	0.044	1.00444	0.040	1.00399	0.037	1.00363	0.033	1.00329	0.030
1.0	1.00497	**0.00**	1.00450	**0.00**	1.00407	**0.00**	1.00368	**0.00**	1.00333	**0.00**
1.05	1.00491	**0.044**	1.00444	**0.040**	1.00399	**0.037**	1.00363	**0.033**	1.00329	**0.030**
1.1	1.00473	**0.088**	1.00427	**0.079**	1.00387	**0.072**	1.00350	**0.065**	1.00316	**0.059**
1.15	1.00443	**0.129**	1.00400	**0.117**	1.00360	**0.106**	1.00328	**0.096**	1.00297	**0.086**
1.2	1.00402	**0.167**	1.00363	**0.151**	1.00329	**0.137**	1.00297	**0.124**	1.00269	**0.112**
1.25	1.00351	**0.201**	1.00318	**0.182**	1.00287	**0.165**	1.00260	**0.149**	1.00235	**0.135**
1.3	1.00292	**0.229**	1.00264	**0.208**	1.00239	**0.188**	1.00216	**0.170**	1.00196	**0.154**
1.35	1.00225	**0.253**	1.00204	**0.229**	1.00185	**0.207**	1.00167	**0.188**	1.00151	**0.170**
1.4	1.00153	**0.270**	1.00139	**0.244**	1.00125	**0.221**	1.00114	**0.200**	1.00103	**0.181**
1.45	1.00078	**0.281**	1.00070	**0.254**	1.00064	**0.230**	1.00058	**0.208**	1.00052	**0.188**
1.5	1.00000	**0.284**	1.00000	**0.257**	1.00000	**0.233**	1.00000	**0.211**	1.00000	**0.191**
1.55	0.99923	**0.281**	0.99930	**0.254**	0.99937	**0.230**	0.99943	**0.208**	0.99948	**0.188**
1.6	0.99847	**0.270**	0.99862	**0.244**	0.99875	**0.221**	0.99887	**0.200**	0.99897	**0.181**
1.65	0.99775	**0.253**	0.99797	**0.229**	0.99816	**0.207**	0.99833	**0.188**	0.99849	**0.170**
1.7	0.99709	**0.229**	0.99737	**0.208**	0.99762	**0.188**	0.99784	**0.170**	0.99805	**0.154**
1.75	0.99650	**0.201**	0.99683	**0.182**	0.99714	**0.165**	0.99741	**0.149**	0.99765	**0.135**
1.8	0.99600	**0.167**	0.99638	**0.151**	0.99672	**0.137**	0.99703	**0.124**	0.99732	**0.112**
1.85	0.99559	**0.129**	0.99601	**0.117**	0.99639	**0.106**	0.99673	**0.096**	0.99704	**0.086**
1.9	0.99530	**0.088**	0.99575	**0.079**	0.99615	**0.072**	0.99651	**0.065**	0.99685	**0.059**
1.95	0.99511	**0.044**	0.99558	**0.040**	0.99600	**0.037**	0.99638	**0.033**	0.99672	**0.030**
2.0	0.99505	**0.00**	0.99552	**0.00**	0.99595	**0.00**	0.99633	**0.00**	0.99668	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.2 + i\,0) = 0.99668 \underline{/0°}$.

$\tanh(3.2 + i\,\underline{1.05}) = 1.00329 \overline{\backslash 0°.030} = 1.00329 \overline{\backslash 0°.1'.48''}$.

TABLE XII. HYPERBOLIC TANGENTS. $\tanh(x + iq) = r \angle \gamma$. CONTINUED

q	x = 3.25 r	x = 3.25 γ (°)	x = 3.3 r	x = 3.3 γ (°)	x = 3.35 r	x = 3.35 γ (°)	x = 3.4 r	x = 3.4 γ (°)	x = 3.45 r	x = 3.45 γ (°)
0	0.99700	0.00	0.99728	0.00	0.99754	0.00	0.99777	0.00	0.99799	0.00
0.05	0.99703	0.027	0.99732	0.024	0.99757	0.022	0.99780	0.020	0.99801	0.018
0.1	0.99714	0.053	0.99741	0.048	0.99766	0.044	0.99788	0.039	0.99809	0.036
0.15	0.99732	0.078	0.99758	0.071	0.99781	0.064	0.99802	0.058	0.99821	0.052
0.2	0.99757	0.101	0.99780	0.092	0.99801	0.083	0.99820	0.075	0.99837	0.068
0.25	0.99788	0.122	0.99807	0.110	0.99826	0.100	0.99843	0.090	0.99858	0.082
0.3	0.99823	0.139	0.99840	0.126	0.99855	0.114	0.99869	0.103	0.99882	0.094
0.35	0.99864	0.153	0.98877	0.139	0.99888	0.126	0.99899	0.114	0.99909	0.103
0.4	0.99907	0.164	0.99916	0.148	0.99924	0.134	0.99931	0.121	0.99938	0.110
0.45	0.99953	0.170	0.99958	0.154	0.99962	0.139	0.99965	0.126	0.99968	0.114
0.5	1.00000	0.172	1.00000	0.156	1.00000	0.141	1.00000	0.128	1.00000	0.116
0.55	1.00047	0.170	1.00042	0.154	1.00039	0.139	1.00035	0.126	1.00032	0.114
0.6	1.00093	0.164	1.00084	0.148	1.00076	0.134	1.00069	0.121	1.00062	0.110
0.65	1.00137	0.153	1.00124	0.139	1.00112	0.126	1.00101	0.114	1.00092	0.103
0.7	1.00177	0.139	1.00160	0.126	1.00145	0.114	1.00131	0.103	1.00118	0.094
0.75	1.00213	0.122	1.00193	0.110	1.00174	0.100	1.00158	0.090	1.00143	0.082
0.8	1.00244	0.101	1.00220	0.092	1.00199	0.083	1.00180	0.075	1.00163	0.068
0.85	1.00268	0.078	1.00243	0.071	1.00220	0.064	1.00199	0.058	1.00180	0.052
0.9	1.00286	0.053	1.00259	0.048	1.00234	0.044	1.00212	0.039	1.00192	0.036
0.95	1.00297	0.027	1.00269	0.024	1.00243	0.022	1.00220	0.020	1.00199	0.018
1.0	1.00301	**0.00**	1.00273	**0.00**	1.00246	**0.00**	1.00223	**0.00**	1.00202	**0.00**
1.05	1.00297	**0.027**	1.00269	**0.024**	1.00243	**0.022**	1.00220	**0.020**	1.00199	**0.018**
1.1	1.00286	**0.053**	1.00259	**0.048**	1.00234	**0.044**	1.00212	**0.039**	1.00192	**0.036**
1.15	1.00268	**0.078**	1.00243	**0.071**	1.00220	**0.064**	1.00199	**0.058**	1.00180	**0.052**
1.2	1.00244	**0.101**	1.00220	**0.092**	1.00199	**0.083**	1.00180	**0.075**	1.00163	**0.068**
1.25	1.00213	**0.122**	1.00193	**0.110**	1.00174	**0.100**	1.00158	**0.090**	1.00143	**0.082**
1.3	1.00177	**0.139**	1.00160	**0.126**	1.00145	**0.114**	1.00131	**0.103**	1.00118	**0.094**
1.35	1.00137	**0.153**	1.00124	**0.139**	1.00112	**0.126**	1.00101	**0.114**	1.00092	**0.103**
1.4	1.00093	**0.164**	1.00084	**0.148**	1.00076	**0.134**	1.00069	**0.121**	1.00062	**0.110**
1.45	1.00047	**0.170**	1.00042	**0.154**	1.00039	**0.139**	1.00035	**0.126**	1.00032	**0.114**
1.5	1.00000	**0.172**	1.00000	**0.156**	1.00000	**0.141**	1.00000	**0.128**	1.00000	**0.116**
1.55	0.99953	**0.170**	0.99958	**0.154**	0.99962	**0.139**	0.99965	**0.126**	0.99968	**0.114**
1.6	0.99907	**0.164**	0.99916	**0.148**	0.99924	**0.134**	0.99931	**0.121**	0.99938	**0.110**
1.65	0.99864	**0.153**	0.99877	**0.139**	0.99888	**0.126**	0.99899	**0.114**	0.99909	**0.103**
1.7	0.99823	**0.139**	0.99840	**0.126**	0.99855	**0.114**	0.99869	**0.103**	0.99882	**0.094**
1.75	0.99788	**0.122**	0.99807	**0.110**	0.99826	**0.100**	0.99843	**0.090**	0.99858	**0.082**
1.8	0.99757	**0.101**	0.99780	**0.092**	0.99801	**0.083**	0.99820	**0.075**	0.99837	**0.068**
1.85	0.99732	**0.078**	0.99758	**0.071**	0.99781	**0.064**	0.99802	**0.058**	0.99821	**0.052**
1.9	0.99714	**0.053**	0.99741	**0.048**	0.99766	**0.044**	0.99788	**0.039**	0.99809	**0.036**
1.95	0.99703	**0.027**	0.99732	**0.024**	0.99757	**0.022**	0.99780	**0.020**	0.99801	**0.018**
2.0	0.99700	**0.00**	0.99728	**0.00**	0.99754	**0.00**	0.99777	**0.00**	0.99799	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.4 + i\,0.7) = 1.00131 \angle 0^\circ.103 = 1.00131 \angle 0^\circ.06'.11''$.

$\tanh(3.45 + i\,1.4) = 1.00062 \,\overline{\backslash 0^\circ.110} = 1.00062 \,\overline{\backslash 0^\circ.06'.36''}$.

	$x = 3.5$		$x = 3.55$		$x = 3.6$		$x = 3.65$		$x = 3.7$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.99818	0.00	0.99835	0.00	0.99851	0.00	0.99865	0.00	0.99878	0.00
0.05	0.99820	0.016	0.99837	0.015	0.99853	0.013	0.99867	0.012	0.99879	0.011
0.1	0.99827	0.032	0.99843	0.029	0.99858	0.026	0.99872	0.024	0.99884	0.022
0.15	0.99838	0.047	0.99853	0.043	0.99867	0.039	0.99880	0.035	0.99891	0.032
0.2	0.99853	0.061	0.99867	0.055	0.99879	0.050	0.99891	0.046	0.99901	0.041
0.25	0.99871	0.074	0.99883	0.067	0.98894	0.061	0.99905	0.055	0.99914	0.050
0.3	0.99893	0.084	0.99903	0.076	0.99912	0.069	0.99921	0.063	0.99928	0.057
0.35	0.99917	0.093	0.99925	0.084	0.99932	0.076	0.99939	0.069	0.99945	0.063
0.4	0.99944	0.099	0.99949	0.090	0.99954	0.081	0.99958	0.074	0.99962	0.067
0.45	0.99972	0.103	0.99974	0.093	0.99977	0.085	0.99979	0.076	0.99981	0.069
0.5	1.00000	0.104	1.00000	0.095	1.00000	0.086	1.00000	0.077	1.00000	0.070
0.55	1.00028	0.103	1.00026	0.093	1.00023	0.085	1.00021	0.076	1.00019	0.069
0.6	1.00056	0.099	1.00051	0.090	1.00046	0.081	1.00042	0.074	1.00038	0.067
0.65	1.00083	0.093	1.00075	0.084	1.00068	0.076	1.00061	0.069	1.00056	0.063
0.7	1.00107	0.084	1.00097	0.076	1.00088	0.069	1.00079	0.063	1.00072	0.057
0.75	1.00129	0.074	1.00117	0.067	1.00106	0.061	1.00096	0.055	1.00087	0.050
0.8	1.00148	0.061	1.00134	0.056	1.00121	0.050	1.00109	0.046	1.00099	0.041
0.85	1.00163	0.048	1.00147	0.043	1.00133	0.039	1.00120	0.035	1.00109	0.032
0.9	1.00174	0.032	1.00157	0.029	1.00142	0.026	1.00129	0.024	1.00117	0.022
0.95	1.00180	0.016	1.00163	0.015	1.00148	0.013	1.00134	0.012	1.00121	0.011
1.0	1.00183	**0.00**	1.00165	**0.00**	1.00149	**0.00**	1.00135	**0.00**	1.00122	**0.00**
1.05	1.00180	**0.016**	1.00163	**0.015**	1.00148	**0.013**	1.00134	**0.012**	1.00121	**0.011**
1.1	1.00174	**0.032**	1.00157	**0.029**	1.00142	**0.026**	1.00129	**0.024**	1.00117	**0.022**
1.15	1.00163	**0.048**	1.00147	**0.043**	1.00133	**0.039**	1.00120	**0.035**	1.00109	**0.032**
1.2	1.00148	**0.061**	1.00134	**0.056**	1.00121	**0.050**	1.00109	**0.046**	1.00099	**0.041**
1.25	1.00129	**0.074**	1.00117	**0.067**	1.00106	**0.061**	1.00096	**0.055**	1.00087	**0.050**
1.3	1.00107	**0.084**	1.00097	**0.076**	1.00088	**0.069**	1.00079	**0.063**	1.00072	**0.057**
1.35	1.00083	**0.093**	1.00075	**0.084**	1.00068	**0.076**	1.00061	**0.069**	1.00056	**0.063**
1.4	1.00056	**0.099**	1.00051	**0.090**	1.00046	**0.081**	1.00042	**0.074**	1.00038	**0.067**
1.45	1.00028	**0.103**	1.00026	**0.093**	1.00023	**0.085**	1.00021	**0.076**	1.00019	**0.069**
1.5	1.00000	**0.104**	1.00000	**0.095**	1.00000	**0.086**	1.00000	**0.077**	1.00000	**0.070**
1.55	0.99972	**0.103**	0.99974	**0.093**	0.99977	**0.085**	0.99979	**0.076**	0.99981	**0.069**
1.6	0.99944	**0.099**	0.99949	**0.090**	0.99954	**0.081**	0.99958	**0.074**	0.99962	**0.067**
1.65	0.99917	**0.093**	0.99925	**0.084**	0.99932	**0.076**	0.99939	**0.069**	0.99945	**0.063**
1.7	0.99893	**0.084**	0.99903	**0.076**	0.99912	**0.069**	0.99921	**0.063**	0.99928	**0.057**
1.75	0.99871	**0.074**	0.99883	**0.067**	0.99894	**0.061**	0.99905	**0.055**	0.99914	**0.050**
1.8	0.99853	**0.061**	0.99867	**0.055**	0.99879	**0.050**	0.99891	**0.046**	0.99901	**0.041**
1.85	0.99838	**0.047**	0.99853	**0.043**	0.99867	**0.039**	0.99880	**0.035**	0.99891	**0.032**
1.9	0.99827	**0.032**	0.99843	**0.029**	0.99858	**0.026**	0.99872	**0.024**	0.99884	**0.022**
1.95	0.99820	**0.016**	0.99837	**0.015**	0.99853	**0.013**	0.99867	**0.012**	0.99879	**0.011**
2.0	0.99818	**0.00**	0.99835	**0.00**	0.99851	**0.00**	0.99865	**0.00**	0.99878	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.6 + i\,0) = 0.99851 \underline{/0°}$.

$\tanh(3.7 + i\,\underline{1.7}) = 0.99928 \overline{\backslash 0°.057} = 0.99928 \overline{\backslash 0°.03'.25''}$.

	$x = 3.75$		$x = 3.8$		$x = 3.85$		$x = 3.9$		$x = 3.95$	
q	r	γ	r	γ	r	γ	r	γ	r	γ
		°		°		°		°		°
0	0.99889	0.00	0.99900	0.00	0.99909	0.00	0.99918	0.00	0.99926	0.00
0.05	0.99891	0.010	0.99901	0.009	0.99911	0.008	0.99919	0.007	0.99927	0.007
0.1	0.99895	0.020	0.99905	0.018	0.99914	0.016	0.99922	0.015	0.99930	0.013
0.15	0.99902	0.029	0.99911	0.026	0.99919	0.024	0.99927	0.021	0.99934	0.019
0.2	0.99911	0.037	0.99919	0.034	0.99927	0.031	0.99934	0.028	0.99940	0.025
0.25	0.99922	0.045	0.99929	0.041	0.99936	0.037	0.99942	0.033	0.99948	0.030
0.3	0.99935	0.051	0.99941	0.046	0.99947	0.042	0.99952	0.038	0.99956	0.034
0.35	0.99950	0.056	0.99955	0.051	0.99959	0.046	0.99963	0.042	0.99966	0.038
0.4	0.99966	0.060	0.99969	0.055	0.99972	0.049	0.99975	0.045	0.99977	0.040
0.45	0.99983	0.063	0.99984	0.057	0.99986	0.051	0.99987	0.046	0.99988	0.042
0.5	1.00000	0.063	1.00000	0.057	1.00000	0.052	1.00000	0.047	1.00000	0.043
0.55	1.00017	0.063	1.00016	0.057	1.00014	0.051	1.00013	0.046	1.00012	0.042
0.6	1.00034	0.060	1.00031	0.055	1.00028	0.049	1.00025	0.045	1.00023	0.040
0.65	1.00050	0.056	1.00045	0.051	1.00041	0.046	1.00037	0.042	1.00034	0.038
0.7	1.00065	0.051	1.00059	0.046	1.00053	0.042	1.00048	0.038	1.00044	0.034
0.75	1.00078	0.045	1.00071	0.041	1.00064	0.037	1.00058	0.033	1.00052	0.030
0.8	1.00089	0.037	1.00081	0.034	1.00073	0.031	1.00066	0.028	1.00060	0.025
0.85	1.00099	0.029	1.00089	0.026	1.00081	0.024	1.00073	0.021	1.00066	0.019
0.9	1.00105	0.020	1.00095	0.018	1.00086	0.016	1.00078	0.015	1.00071	0.013
0.95	1.00109	0.010	1.00099	0.009	1.00089	0.008	1.00081	0.007	1.00073	0.007
1.0	1.00111	**0.00**	1.00100	**0.00**	1.00090	**0.00**	1.00082	**0.00**	1.00074	**0.00**
1.05	1.00109	**0.010**	1.00099	**0.009**	1.00089	**0.008**	1.00081	**0.007**	1.00073	**0.007**
1.1	1.00105	**0.020**	1.00095	**0.018**	1.00086	**0.016**	1.00078	**0.015**	1.00071	**0.013**
1.15	1.00099	**0.029**	1.00089	**0.026**	1.00081	**0.024**	1.00073	**0.021**	1.00066	**0.019**
1.2	1.00089	**0.037**	1.00081	**0.034**	1.00073	**0.031**	1.00066	**0.028**	1.00060	**0.025**
1.25	1.00078	**0.045**	1.00071	**0.041**	1.00064	**0.037**	1.00058	**0.033**	1.00052	**0.030**
1.3	1.00065	**0.051**	1.00059	**0.046**	1.00053	**0.042**	1.00048	**0.038**	1.00044	**0.034**
1.35	1.00050	**0.056**	1.00045	**0.051**	1.00041	**0.046**	1.00037	**0.042**	1.00034	**0.038**
1.4	1.00034	**0.060**	1.00031	**0.055**	1.00028	**0.049**	1.00025	**0.045**	1.00023	**0.040**
1.45	1.00017	**0.063**	1.00016	**0.057**	1.00014	**0.051**	1.00013	**0.046**	1.00012	**0.042**
1.5	1.00000	**0.063**	1.00000	**0.057**	1.00000	**0.052**	1.00000	**0.047**	1.00000	**0.043**
1.55	0.99983	**0.063**	0.99984	**0.057**	0.99986	**0.051**	0.99987	**0.046**	0.99988	**0.042**
1.6	0.99966	**0.060**	0.99969	**0.055**	0.99972	**0.049**	0.99975	**0.045**	0.99977	**0.040**
1.65	0.99950	**0.056**	0.99955	**0.051**	0.99959	**0.046**	0.99963	**0.042**	0.99966	**0.038**
1.7	0.99935	**0.051**	0.99941	**0.046**	0.99947	**0.042**	0.99952	**0.038**	0.99956	**0.034**
1.75	0.99922	**0.045**	0.99929	**0.041**	0.99936	**0.037**	0.99942	**0.033**	0.99948	**0.030**
1.8	0.99911	**0.037**	0.99919	**0.034**	0.99927	**0.031**	0.99934	**0.028**	0.99940	**0.025**
1.85	0.99902	**0.029**	0.99911	**0.026**	0.99919	**0.024**	0.99927	**0.021**	0.99934	**0.019**
1.9	0.99895	**0.020**	0.99905	**0.018**	0.99914	**0.016**	0.99922	**0.015**	0.99930	**0.013**
1.95	0.99891	**0.010**	0.99901	**0.009**	0.99911	**0.008**	0.99919	**0.007**	0.99927	**0.007**
2.0	0.99889	**0.00**	0.99900	**0.00**	0.99909	**0.00**	0.99918	**0.00**	0.99926	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\tanh(3.95 + i\,\underline{0.9}) = 1.00071\,\underline{/0^\circ.013} = 1.00071\,\underline{/0^\circ.0'.47''}.$

$\tanh(3.95 + i\,\underline{1.9}) = 0.99930\,\overline{\backslash 0^\circ.013} = 0.99930\,\overline{\backslash 0^\circ.0'.47''}.$

TABLE XIII. FUNCTIONS OF $4 + iq$. $f(4 + iq) = u + iv$

	sinh		cosh		tanh	
q	u	v	u	v	u	v
0	27.28992	0.00	27.30823	0.00	0.99933	0.00
0.05	27.20579	2.14258	27.22405	2.14114	0.99934	0.00010
0.1	26.95392	4.27195	26.97202	4.26908	0.99936	0.00021
0.15	26.53588	6.37498	26.55370	6.37071	0.99940	0.00030
0.2	25.95425	8.43871	25.97166	8.43305	0.99946	0.00039
0.25	25.21260	10.45041	25.22951	10.44340	0.99953	0.00047
0.3	24.31551	12.39768	24.33181	12.38935	0.99961	0.00054
0.35	23.26848	14.26851	23.28410	14.25895	0.99970	0.00060
0.4	22.07800	16.05138	22.09282	16.04061	0.99979	0.00064
0.45	20.75141	17.73528	20.76534	17.72339	0.99989	0.00066
0.5	19.29688	19.30983	19.30983	19.29688	1.00000	0.00067
0.55	17.72339	20.76534	17.73528	20.75141	1.00011	0.00066
0.6	16.04061	22.09282	16.05138	22.07800	1.00021	0.00064
0.65	14.25895	23.28410	14.26851	23.26848	1.00030	0.00060
0.7	12.38935	24.33181	12.39768	24.31551	1.00039	0.00054
0.75	10.44340	25.22951	10.45041	25.21260	1.00047	0.00047
0.8	8.43305	25.97166	8.43871	25.95425	1.00054	0.00039
0.85	6.37071	26.55370	6.37498	26.53588	1.00060	0.00030
0.9	4.26908	26.97202	4.27195	26.95392	1.00064	0.00021
0.95	2.14114	27.22405	2.14258	27.20579	1.00066	0.00011
1.0	**0.00**	27.30823	**0.00**	27.28992	1.00067	**0.00**
1.05	**2.14114**	27.22405	**2.14258**	27.20579	1.00066	**0.00011**
1.1	**4.26908**	26.97202	**4.27195**	26.95392	1.00064	**0.00021**
1.15	**6.37071**	26.55370	**6.37498**	26.53588	1.00060	**0.00030**
1.2	**8.43305**	25.97166	**8.43871**	25.95425	1.00054	**0.00039**
1.25	**10.44340**	25.22951	**10.45041**	25.21260	1.00047	**0.00047**
1.3	**12.38935**	24.33181	**12.39768**	24.31551	1.00039	**0.00054**
1.35	**14.25895**	23.28410	**14.26851**	23.26848	1.00030	**0.00060**
1.4	**16.04061**	22.09282	**16.05138**	22.07800	1.00021	**0.00064**
1.45	**17.72339**	20.76534	**17.73528**	20.75141	1.00011	**0.00066**
1.5	**19.29688**	19.30983	**19.30983**	19.29688	1.00000	**0.00067**
1.55	**20.75141**	17.73528	**20.76534**	17.72339	0.99989	**0.00066**
1.6	**22.07800**	16.05138	**22.09282**	16.04061	0.99979	**0.00064**
1.65	**23.26848**	14.26851	**23.28410**	14.25895	0.99970	**0.00060**
1.7	**24.31551**	12.39768	**24.33181**	12.38935	0.99961	**0.00054**
1.75	**25.21260**	10.45041	**25.22951**	10.44340	0.99953	**0.00047**
1.8	**25.95425**	8.43871	**25.97166**	8.43305	0.99946	**0.00039**
1.85	**26.53588**	6.37498	**26.55370**	6.37071	0.99940	**0.00030**
1.9	**26.95392**	4.27195	**26.97202**	4.26908	0.99936	**0.00021**
1.95	**27.20579**	2.14258	**27.22405**	2.14114	0.99934	**0.00010**
2.0	**27.28992**	0.00	**27.30823**	0.00	0.99933	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\sinh(4 + i\,\underline{0.7}) = 12.38935 + i\,24.33181.$
$\cosh(4 + i\,\underline{1.25}) = -10.45041 + i\,25.21260.$

Table XIII. FUNCTIONS OF $4 + iq$. $f(4 + iq) = r\angle\gamma$

	sinh		cosh		tanh	
q	r	γ	r	γ	r	γ
		°		°		°
0	27.28992	0.00	27.30823	0.00	0.99933	0.00
0.05	27.29002	4.503	27.30810	4.497	0.99934	0.006
0.1	27.29036	9.006	27.30780	8.994	0.99936	0.012
0.15	27.29090	13.509	27.30723	13.491	0.99940	0.018
0.2	27.29166	18.011	27.30650	17.989	0.99946	0.023
0.25	27.29260	22.514	27.30550	22.486	0.99953	0.027
0.3	27.29370	27.016	27.30445	26.984	0.99961	0.031
0.35	27.29492	31.517	27.30324	31.483	0.99970	0.034
0.4	27.29624	36.018	27.30190	35.982	0.99979	0.037
0.45	27.29764	40.519	27.30050	40.481	0.99990	0.038
0.5	27.29908	45.019	27.29908	44.981	1.00000	0.038
0.55	27.30050	49.519	27.29764	49.481	1.00010	0.038
0.6	27.30190	54.018	27.29624	53.982	1.00021	0.037
0.65	27.30324	58.517	27.29492	58.483	1.00030	0.034
0.7	27.30445	63.016	27.29370	62.984	1.00039	0.031
0.75	27.30550	67.514	27.29260	67.486	1.00047	0.027
0.8	27.30650	72.011	27.29166	71.989	1.00054	0.023
0.85	27.30723	76.509	27.29090	76.491	1.00060	0.018
0.9	27.30780	81.006	27.29036	80.994	1.00064	0.012
0.95	27.30810	85.503	27.29002	85.497	1.00066	0.006
1.0	27.30823	90	27.28992	90	1.00067	**0.00**
1.05	27.30810	94.497	27.29002	94.503	1.00066	**0.006**
1.1	27.30780	98.994	27.29036	99.006	1.00064	**0.012**
1.15	27.30723	103.491	27.29090	103.509	1.00060	**0.018**
1.2	27.30650	107.989	27.29166	108.011	1.00054	**0.023**
1.25	27.30550	112.486	27.29260	112.514	1.00047	**0.027**
1.3	27.30445	116.984	27.29370	117.016	1.00039	**0.031**
1.35	27.30324	121.483	27.29492	121.517	1.00030	**0.034**
1.4	27.30190	125.982	27.29624	126.018	1.00021	**0.037**
1.45	27.30050	130.481	27.29764	130.519	1.00010	**0.038**
1.5	27.29908	134.981	27.29908	135.019	1.00000	**0.038**
1.55	27.29764	139.481	27.30050	139.519	0.99990	**0.038**
1.6	27.29624	143.982	27.30190	144.018	0.99979	**0.037**
1.65	27.29492	148.483	27.30324	148.517	0.99970	**0.034**
1.7	27.29370	152.984	27.30445	153.016	0.99961	**0.031**
1.75	27.29260	157.486	27.30550	157.514	0.99953	**0.027**
1.8	27.29166	161.989	27.30650	162.011	0.99946	**0.023**
1.85	27.29090	166.491	27.30723	166.509	0.99940	**0.018**
1.9	27.29036	170.994	27.30780	171.006	0.99936	**0.012**
1.95	27.29002	175.497	27.30810	175.503	0.99934	**0.006**
2.0	27.28992	180	27.30823	180	0.99933	**0.00**

Note. Negative quantities are in heavy type.

Examples. $\sinh(4 + i\,\underline{1.0}) = 27.30823\,\underline{/90^\circ}.$

$\tanh(4 + i\,\underline{1.5}) = 1.0000\,\overline{\backslash 0^\circ.038} = 1.0000\,\overline{\backslash 0^\circ.02'.17''}.$

Table XIV. SEMI-EXPONENTIALS. $\frac{e^x}{2}$ and $\log_{10}\left(\frac{e^x}{2}\right)$

x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$
4.00	27.299	1.4361479	4.50	45.009	1.6532952	5.00	74.207	1.8704424
4.01	27.573	1.4404909	4.51	45.461	1.6576381	5.01	74.952	1.8747854
4.02	27.851	1.4448338	4.52	45.918	1.6619811	5.02	75.706	1.8791283
4.03	28.130	1.4491768	4.53	46.379	1.6663240	5.03	76.467	1.8834712
4.04	28.413	1.4535197	4.54	46.845	1.6706669	5.04	77.235	1.8878142
4.05	28.699	1.4578627	4.55	47.316	1.6750099	5.05	78.011	1.8921571
4.06	28.987	1.4622056	4.56	47.792	1.6793528	5.06	78.795	1.8965001
4.07	29.278	1.4665485	4.57	48.272	1.6836958	5.07	79.587	1.9008430
4.08	29.573	1.4708915	4.58	48.757	1.6880387	5.08	80.387	1.9051860
4.09	29.870	1.4752344	4.59	49.247	1.6923817	5.09	81.195	1.9095289
4.10	30.170	1.4795774	4.60	49.742	1.6967246	5.10	82.011	1.9138719
4.11	30.473	1.4839203	4.61	50.242	1.7010676	5.11	82.835	1.9182148
4.12	30.780	1.4882633	4.62	50.747	1.7054105	5.12	83.668	1.9225577
4.13	31.089	1.4926062	4.63	51.257	1.7097535	5.13	84.509	1.9269007
4.14	31.401	1.4969492	4.64	51.772	1.7140964	5.14	85.358	1.9312436
4.15	31.717	1.5012921	4.65	52.292	1.7184393	5.15	86.216	1.9355866
4.16	32.036	1.5056350	4.66	52.818	1.7227823	5.16	87.082	1.9399295
4.17	32.358	1.5099780	4.67	53.349	1.7271252	5.17	87.957	1.9442725
4.18	32.683	1.5143209	4.68	53.885	1.7314682	5.18	88.841	1.9486154
4.19	33.011	1.5186639	4.69	54.427	1.7358111	5.19	89.734	1.9529584
4.20	33.343	1.5230068	4.70	54.974	1.7401541	5.20	90.636	1.9573013
4.21	33.678	1.5273498	4.71	55.526	1.7444970	5.21	91.547	1.9616443
4.22	34.017	1.5316927	4.72	56.084	1.7488400	5.22	92.467	1.9659872
4.23	34.359	1.5360357	4.73	56.648	1.7531829	5.23	93.396	1.9703301
4.24	34.704	1.5403786	4.74	57.217	1.7575258	5.24	94.335	1.9746731
4.25	35.053	1.5447215	4.75	57.792	1.7618688	5.25	95.283	1.9790160
4.26	35.405	1.5490645	4.76	58.373	1.7662117	5.26	96.241	1.9833590
4.27	35.761	1.5534074	4.77	58.960	1.7705547	5.27	97.208	1.9877019
4.28	36.120	1.5577504	4.78	59.552	1.7748976	5.28	98.185	1.9920449
4.29	36.483	1.5620933	4.79	60.151	1.7792406	5.29	99.172	1.9963878
4.30	36.850	1.5664363	4.80	60.755	1.7835835	5.30	100.168	2.0007308
4.31	37.220	1.5707792	4.81	61.366	1.7879265	5.31	101.175	2.0050737
4.32	37.594	1.5751222	4.82	61.983	1.7922694	5.32	102.192	2.0094166
4.33	37.972	1.5794651	4.83	62.605	1.7966123	5.33	103.219	2.0137596
4.34	38.354	1.5838081	4.84	63.235	1.8009553	5.34	104.256	2.0181025
4.35	38.739	1.5881510	4.85	63.870	1.8052982	5.35	105.304	2.0224455
4.36	39.129	1.5924939	4.86	64.512	1.8096412	5.36	106.362	2.0267884
4.37	39.522	1.5968369	4.87	65.160	1.8139841	5.37	107.431	2.0311314
4.38	39.919	1.6011798	4.88	65.815	1.8183271	5.38	108.511	2.0354743
4.39	40.320	1.6055228	4.89	66.477	1.8226700	5.39	109.602	2.0398173
4.40	40.725	1.6098657	4.90	67.145	1.8270130	5.40	110.703	2.0441602
4.41	41.135	1.6142087	4.91	67.820	1.8313559	5.41	111.816	2.0485031
4.42	41.548	1.6185516	4.92	68.501	1.8356989	5.42	112.940	2.0528461
4.43	41.966	1.6228946	4.93	69.190	1.8400418	5.43	114.075	2.0571890
4.44	42.387	1.6272375	4.94	69.885	1.8443847	5.44	115.221	2.0615320
4.45	42.813	1.6315804	4.95	70.587	1.8487277	5.45	116.379	2.0658749
4.46	43.244	1.6359234	4.96	71.297	1.8530706	5.46	117.549	2.0702179
4.47	43.678	1.6402663	4.97	72.013	1.8574136	5.47	118.730	2.0745608
4.48	44.117	1.6446093	4.98	72.737	1.8617565	5.48	119.923	2.0789038
4.49	44.561	1.6489522	4.99	73.468	1.8660995	5.49	121.129	2.0832467
4.50	45.009	1.6532952	5.00	74.207	1.8704424	5.50	122.346	2.0875897

Example. $\frac{e^{4.20}}{2} = 33.343 \qquad \log_{10}\left(\frac{e^{4.20}}{2}\right) = 1.5230068.$

TABLE XIV. SEMI-EXPONENTIALS. $\frac{e^x}{2}$ and $\log_{10}\left(\frac{e^x}{2}\right)$. CONTINUED

x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$
5.50	122.346	2.0875897	6.00	201.714	2.3047369	6.50	332.571	2.5218844
5.51	123.576	2.0919326	6.01	203.742	2.3090785	6.51	335.913	2.5262268
5.52	124.818	2.0962755	6.02	205.789	2.3134222	6.52	339.289	2.5305699
5.53	126.072	2.1006185	6.03	207.858	2.3177667	6.53	342.699	2.5349128
5.54	127.339	2.1049614	6.04	209.947	2.3221098	6.54	346.143	2.5392556
5.55	128.619	2.1093044	6.05	212.057	2.3264527	6.55	349.622	2.5435988
5.56	129.911	2.1136473	6.06	214.188	2.3307951	6.56	353.135	2.5479408
5.57	131.217	2.1179903	6.07	216.340	2.3351368	6.57	356.685	2.5522849
5.58	132.536	2.1223332	6.08	218.514	2.3394793	6.58	360.270	2.5566281
5.59	133.868	2.1266762	6.09	220.711	2.3438220	6.59	363.890	2.5609701
5.60	135.213	2.1310191	6.10	222.929	2.3481666	6.60	367.547	2.5653129
5.61	136.572	2.1353620	6.11	225.169	2.3525086	6.61	371.241	2.5696560
5.62	137.945	2.1397050	6.12	227.432	2.3568516	6.62	374.973	2.5740000
5.63	139.331	2.1440479	6.13	229.718	2.3611951	6.63	378.741	2.5783424
5.64	140.731	2.1483909	6.14	232.027	2.3655386	6.64	382.547	2.5826849
5.65	142.146	2.1527338	6.15	234.359	2.3698817	6.65	386.391	2.5870270
5.66	143.574	2.1570768	6.16	236.714	2.3742240	6.66	390.275	2.5913708
5.67	145.017	2.1614197	6.17	239.093	2.3785669	6.67	394.197	2.5957134
5.68	146.475	2.1657627	6.18	241.496	2.3829100	6.68	398.160	2.6000576
5.69	147.947	2.1701056	6.19	243.923	2.3872527	6.69	402.161	2.6044000
5.70	149.434	2.1744485	6.20	246.375	2.3915966	6.70	406.202	2.6087420
5.71	150.936	2.1787915	6.21	248.851	2.3959394	6.71	410.285	2.6130856
5.72	152.452	2.1831344	6.22	251.352	2.4002824	6.72	414.409	2.6174292
5.73	153.985	2.1874774	6.23	253.877	2.4046234	6.73	418.574	2.6217721
5.74	155.532	2.1918203	6.24	256.429	2.4089672	6.74	422.780	2.6261144
5.75	157.095	2.1961633	6.25	259.006	2.4133099	6.75	427.030	2.6304584
5.76	158.674	2.2005062	6.26	261.609	2.4176526	6.76	431.321	2.6348006
5.77	160.269	2.2048492	6.27	264.239	2.4219970	6.77	435.656	2.6391436
5.78	161.880	2.2091921	6.28	266.894	2.4263388	6.78	440.034	2.6434862
5.79	163.507	2.2135351	6.29	269.576	2.4306813	6.79	444.457	2.6478298
5.80	165.150	2.2178780	6.30	272.285	2.4350237	6.80	448.923	2.6521719
5.81	166.810	2.2222209	6.31	275.022	2.4393675	6.81	453.435	2.6565151
5.82	168.486	2.2265639	6.32	277.786	2.4437104	6.82	457.993	2.6608589
5.83	170.179	2.2309068	6.33	280.578	2.4480536	6.83	462.595	2.6652009
5.84	171.890	2.2352498	6.34	283.398	2.4523967	6.84	467.244	2.6995437
5.85	173.617	2.2395927	6.35	286.246	2.4567394	6.85	471.940	2.6738868
5.86	175.362	2.2439357	6.36	289.123	2.4610826	6.86	476.683	2.6782296
5.87	177.124	2.2482786	6.37	292.029	2.4654260	6.87	481.474	2.6825728
5.88	178.905	2.2526216	6.38	294.964	2.4697690	6.88	486.312	2.6869150
5.89	180.703	2.2569645	6.39	297.928	2.4741114	6.89	491.200	2.6912584
5.90	182.519	2.2613074	6.40	300.922	2.4784540	6.90	496.137	2.6956016
5.91	184.353	2.2656504	6.41	303.947	2.4827979	6.91	501.123	2.6999443
5.92	186.206	2.2699933	6.42	307.002	2.4871412	6.92	506.160	2.7042878
5.93	188.077	2.2743363	6.43	310.087	2.4914836	6.93	511.246	2.7086299
5.94	189.967	2.2786792	6.44	313.203	2.4958260	6.94	516.386	2.7129744
5.95	191.877	2.2830222	6.45	316.352	2.5001705	6.95	521.575	2.7173168
5.96	193.805	2.2873651	6.46	319.530	2.5045116	6.96	526.816	2.7216589
5.97	195.753	2.2917081	6.47	322.742	2.5088555	6.97	532.112	2.7260030
5.98	197.720	2.2960510	6.48	325.985	2.5131977	6.98	537.459	2.7303454
5.99	199.707	2.3003939	6.49	329.262	2.5175416	6.99	542.860	2.7346878
6.00	201.714	2.3047369	6.50	332.571	2.5218844	7.00	548.317	2.7390317

Example. $\frac{e^{5.60}}{2} = 135.213$ $\quad \log_{10}\left(\frac{e^{5.60}}{2}\right) = 2.1310191.$

TABLE XIV. SEMI-EXPONENTIALS. $\frac{e^x}{2}$ and $\log_{10}\left(\frac{e^x}{2}\right)$. CONTINUED

x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$
7.00	548.317	2.7390317	7.50	904.021	2.9561785	8.00	1490.479	3.1733259
7.01	553.827	2.7433741	7.51	913.107	2.9605217	8.01	1505.457	3.1776683
7.02	559.393	2.7477170	7.52	922.284	2.9648647	8.02	1520.589	3.1820118
7.03	565.015	2.7520600	7.53	931.553	2.9692076	8.03	1535.870	3.1863546
7.04	570.694	2.7564033	7.54	940.915	2.9735504	8.04	1551.306	3.1906976
7.05	576.429	2.7607458	7.55	950.371	2.9778932	8.05	1566.895	3.1950399
7.06	582.223	2.7650893	7.56	959.923	2.9822364	8.06	1582.645	3.1993836
7.07	588.074	2.7694320	7.57	969.570	2.9865792	8.07	1598.552	3.2037268
7.08	593.984	2.7737747	7.58	979.314	2.9909220	8.08	1614.617	3.2080694
7.09	599.954	2.7781180	7.59	989.157	2.9952653	8.09	1630.841	3.2124116
7.10	605.984	2.7824612	7.60	999.098	2.9996080	8.10	1647.234	3.2167554
7.11	612.074	2.7868039	7.61	1009.139	3.0039510	8.11	1663.789	3.2210981
7.12	618.225	2.7911467	7.62	1019.281	3.0082939	8.12	1680.510	3.2254412
7.13	624.439	2.7954901	7.63	1029.525	3.0126369	8.13	1697.400	3.2297842
7.14	630.714	2.7998325	7.64	1039.872	3.0169799	8.14	1714.458	3.2341270
7.15	637.053	2.8041755	7.65	1050.323	3.0213229	8.15	1731.690	3.2384703
7.16	643.456	2.8085189	7.66	1060.879	3.0256659	8.16	1749.092	3.2428130
7.17	649.922	2.8128612	7.67	1071.541	3.0300088	8.17	1766.672	3.2471560
7.18	656.454	2.8172043	7.58	1082.310	3.0343517	8.18	1784.427	3.2514988
7.19	663.052	2.8215476	7.69	1093.187	3.0386944	8.19	1802.364	3.2558425
7.20	669.715	2.8258901	7.70	1104.174	3.0430376	8.20	1820.476	3.2601848
7.21	676.446	2.8302331	7.71	1115.271	3.0473806	8.21	1838.774	3.2645284
7.22	683.245	2.8345765	7.72	1126.480	3.0517234	8.22	1857.251	3.2688706
7.23	690.111	2.8389189	7.73	1137.801	3.0560663	8.23	1875.914	3.2732129
7.24	697.047	2.8432620	7.74	1149.236	3.0604092	8.24	1894.770	3.2775566
7.25	704.052	2.8476047	7.75	1160.786	3.0647523	8.25	1913.812	3.2188994
7.26	711.128	2.8519478	7.76	1172.452	3.0690950	8.26	1933.047	3.2862424
7.27	718.275	2.8562908	7.77	1184.236	3.0734383	8.27	1952.473	3.2905850
7.28	725.494	2.8606338	7.78	1196.137	3.0777810	8.28	1972.098	3.2949284
7.29	732.785	2.8649766	7.79	1208.159	3.0821242	8.29	1991.913	3.2992704
7.30	740.150	2.8693197	7.80	1220.301	3.0864670	8.30	2011.936	3.3036142
7.31	747.589	2.8736629	7.81	1232.565	3.0908098	8.31	2032.158	3.3079575
7.32	755.102	2.8780056	7.82	1244.953	3.0951531	8.32	2052.580	3.3123000
7.33	762.691	2.8823487	7.83	1257.465	3.0994961	8.33	2073.206	3.3166425
7.34	770.356	2.8866915	7.84	1270.102	3.1038386	8.34	2094.045	3.3209860
7.35	778.098	2.8910343	7.85	1282.867	3.1081818	8.35	2115.092	3.3253293
7.36	785.918	2.8953772	7.86	1295.760	3.1125246	8.36	2136.347	3.3296718
7.37	793.817	2.8997205	7.87	1308.783	3.1168677	8.37	2157.819	3.3340150
7.38	801.795	2.9040633	7.88	1321.936	3.1212105	8.38	2179.505	3.3383578
7.39	809.853	2.9084062	7.89	1335.222	3.1255535	8.39	2201.409	3.3427008
7.40	817.992	2.9127491	7.90	1348.641	3.1298964	8.40	2223.533	3.3470436
7.41	826.213	2.9170920	7.91	1362.195	3.1342394	8.41	2245.881	3.3513868
7.42	834.517	2.9214351	7.92	1375.886	3.1385826	8.42	2268.452	3.3557296
7.43	842.904	2.9257782	7.93	1389.713	3.1429254	8.43	2291.250	3.3600725
7.44	851.375	2.9301209	7.94	1403.680	3.1472680	8.44	2314.277	3.3644154
7.45	859.932	2.9344641	7.95	1417.787	3.1516110	8.45	2337.536	3.3687583
7.46	868.574	2.9388068	7.96	1432.036	3.1559539	8.46	2361.030	3.3731014
7.47	877.303	2.9431496	7.97	1446.429	3.1602971	8.47	2384.752	3.3774433
7.48	886.120	2.9474925	7.98	1460.966	3.1646402	8.48	2408.725	3.3817872
7.49	895.026	2.9518356	7.99	1475.648	3.1689827	8.49	2432.926	3.3861290
7.50	904.021	2.9561785	8.00	1490.479	3.1733259	8.50	2457.383	3.3904730

Example. $\frac{e^{7.10}}{2} = 605.984 \qquad \log_{10}\left(\frac{e^{7.10}}{2}\right) = 2.7824612.$

TABLE XIV. SEMI-EXPONENTIALS. $\frac{e^x}{2}$ and $\log_{10}\left(\frac{e^x}{2}\right)$. CONTINUED

x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$	x	$\frac{e^x}{2}$	$\log_{10}\frac{e^x}{2}$
8.50	2457.383	3.3904730	9.00	4051.543	3.6076204	9.50	6679.863	3.8247676
8.51	2482.082	3.3948162	9.01	4092.263	3.6119636	9.51	6746.988	3.8291101
8.52	2507.027	3.3991590	9.02	4133.388	3.6163062	9.52	6814.805	3.8334534
8.53	2532.221	3.4035016	9.03	4174.929	3.6206491	9.53	6883.295	3.8377964
8.54	2557.672	3.4078448	9.04	4216.889	3.6249922	9.54	6952.475	3.8421394
8.55	2583.380	3.4121882	9.05	4259.264	3.6293345	9.55	7022.345	3.8464822
8.56	2609.341	3.4165308	9.06	4302.076	3.6336780	9.56	7092.923	3.8508252
8.57	2635.562	3.4208732	9.07	4345.302	3.6380200	9.57	7164.203	3.8551679
8.58	2662.052	3.4252166	9.08	4388.982	3.6423638	9.58	7236.210	3.8595112
8.59	2688.810	3.4295601	9.09	4433.098	3.6467073	9.59	7308.929	3.8638537
8.60	2715.830	3.4339026	9.10	4477.646	3.6510498	9.60	7382.390	3.8681970
8.61	2743.126	3.4382458	9.11	4522.647	3.6553927	9.61	7456.583	3.8725398
8.62	2770.693	3.4425884	9.12	4568.100	3.6597356	9.62	7531.526	3.8768830
8.63	2798.535	3.4469308	9.13	4614.016	3.6640791	9.63	7607.221	3.8812260
8.64	2826.665	3.4512744	9.14	4660.383	3.6684216	9.64	7683.672	3.8855688
8.65	2855.070	3.4556167	9.15	4707.211	3.6727637	9.65	7760.882	3.8899111
8.66	2883.767	3.4599602	9.16	4754.528	3.6771074	9.66	7838.890	3.8942546
8.67	2912.745	3.4643025	9.17	4802.308	3.6814500	9.67	7917.680	3.8985980
8.68	2942.023	3.4686462	9.18	4850.577	3.6857934	9.68	7997.247	3.9029406
8.69	2971.592	3.4729891	9.19	4899.328	3.6901365	9.69	8077.622	3.9072835
8.70	3001.456	3.4773320	9.20	4948.563	3.6944792	9.70	8158.802	3.9116264
8.71	3031.621	3.4816749	9.21	4998.284	3.6988209	9.71	8240.792	3.9159690
8.72	3062.088	3.4860178	9.22	5048.532	3.7031652	9.72	8323.623	3.9203124
8.73	3092.852	3.4903592	9.23	5099.272	3.7075082	9.73	8407.262	3.9246546
8.74	3123.948	3.4947038	9.24	5150.519	3.7118510	9.74	8491.770	3.9289982
8.75	3155.337	3.4990458	9.25	5202.272	3.7161930	9.75	8577.112	3.9333411
8.76	3187.054	3.5033896	9.26	5254.569	3.7205370	9.76	8663.316	3.9376842
8.77	3219.085	3.5077325	9.27	5307.367	3.7248791	9.77	8750.384	3.9420270
8.78	3251.440	3.5120756	9.28	5360.716	3.7292228	9.78	8838.326	3.9463700
8.79	3284.114	3.5164182	9.29	5414.587	3.7335654	9.79	8927.154	3.9507131
8.80	3317.122	3.5207614	9.30	5469.009	3.7379086	9.80	9016.875	3.9550560
8.81	3350.460	3.5251044	9.31	5523.975	3.7422517	9.81	9107.481	3.9593983
8.82	3384.133	3.5294474	9.32	5579.491	3.7465946	9.82	9199.026	3.9637418
8.83	3418.141	3.5337900	9.33	5635.563	3.7509373	9.83	9291.480	3.9680850
8.84	3452.496	3.5381332	9.34	5692.203	3.7552804	9.84	9384.860	3.9724278
8.85	3487.197	3.5424766	9.35	5749.405	3.7596229	9.85	9479.163	3.9767701
8.86	3522.243	3.5468192	9.36	5807.194	3.7639664	9.86	9574.444	3.9811136
8.87	3557.631	3.5511609	9.37	5865.555	3.7683091	9.87	9670.678	3.9854569
8.88	3593.395	3.5555050	9.38	5924.507	3.7726522	9.88	9767.860	3.9897994
8.89	3629.512	3.5598482	9.39	5984.054	3.7769956	9.89	9866.020	3.9941420
8.90	3665.986	3.5641908	9.40	6044.191	3.7813382	9.90	9965.186	3.9984854
8.91	3702.820	3.5685326	9.41	6104.922	3.7856801	9.91	10065.350	4.0028289
8.92	3740.045	3.5728768	9.42	6166.290	3.7900240	9.92	10166.494	4.0071712
8.93	3777.635	3.5772201	9.43	6228.269	3.7943674	9.93	10268.667	4.0115141
8.94	3815.597	3.5815626	9.44	6290.860	3.7987100	9.94	10371.873	4.0158572
8.95	3853.937	3.5859044	9.45	6354.080	3.8030526	9.95	10476.107	4.0201999
8.96	3892.678	3.5902486	9.46	6417.943	3.8073958	9.96	10581.397	4.0245430
8.97	3931.795	3.5945909	9.47	6482.450	3.8117392	9.97	10687.745	4.0288860
8.98	3971.316	3.5989344	9.48	6547.591	3.8160816	9.98	10795.160	4.0332290
8.99	4011.228	3.6032773	9.49	6613.388	3.8204240	9.99	10903.652	4.0375721
9.00	4051.543	3.6076204	9.50	6679.863	3.8247676	10.00	11013.233	4.0419148

Example. $\frac{e^{8.90}}{2} = 3665.986 \quad \log_{10}\left(\frac{e^{8.90}}{2}\right) = 3.5641908.$

Table XV

REAL HYPERBOLIC FUNCTIONS. $f(x + io) = u + io$

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
0.00	0.00	1.00	0.00	∞	1.00	∞	0.00
0.01	0.010000	1.000050	0.01000	100.	0.9999	100.	0.01
0.02	0.020001	1.000200	0.02000	50.	0.9998	50.	0.02
0.03	0.030005	1.000450	0.02999	33.34	0.9995	33.333	0.03
0.04	0.040011	1.000800	0.03998	25.013	0.9992	24.99	0.04
0.05	0.050021	1.001250	0.04996	20.016	0.9987	19.992	0.05
0.06	0.060036	1.001801	0.05993	16.686	0.9982	16.657	0.06
0.07	0.070057	1.002451	0.06989	14.308	0.9975	14.274	0.07
0.08	0.080085	1.003202	0.07983	12.527	0.9968	12.487	0.08
0.09	0.090122	1.004053	0.08976	11.141	0.9959	11.097	0.09
0.10	0.100167	1.005004	0.09967	10.033	0.9950	9.983	0.10
0.11	0.110222	1.006056	0.10956	9.128	0.9940	9.073	0.11
0.12	0.120288	1.007209	0.11943	8.373	0.9928	8.314	0.12
0.13	0.130366	1.008462	0.12927	7.735	0.9916	7.669	0.13
0.14	0.140458	1.009816	0.13909	7.189	0.9902	7.120	0.14
0.15	0.150563	1.011271	0.14888	6.716	0.9888	6.642	0.15
0.16	0.160684	1.012827	0.15865	6.303	0.9873	6.223	0.16
0.17	0.170820	1.014485	0.16838	5.939	0.9857	5.854	0.17
0.18	0.180974	1.016244	0.17808	5.615	0.9840	5.525	0.18
0.19	0.191145	1.018104	0.18775	5.325	0.9822	5.232	0.19
0.20	0.201336	1.020067	0.19737	5.067	0.9803	4.967	0.20
0.21	0.211547	1.022131	0.20696	4.832	0.9784	4.726	0.21
0.22	0.221779	1.024298	0.21652	4.618	0.9763	4.509	0.22
0.23	0.232033	1.026567	0.22603	4.425	0.9742	4.310	0.23
0.24	0.242311	1.028939	0.23549	4.246	0.9719	4.127	0.24
0.25	0.252612	1.031413	0.24492	4.083	0.9695	3.959	0.25
0.26	0.262939	1.033991	0.25430	3.932	0.9671	3.803	0.26
0.27	0.273292	1.036672	0.26363	3.793	0.9646	3.659	0.27
0.28	0.283673	1.039457	0.27290	3.664	0.9620	3.525	0.28
0.29	0.294082	1.042346	0.28214	3.544	0.9591	3.400	0.29
0.30	0.304520	1.045339	0.29131	3.433	0.9566	3.284	0.30
0.31	0.314989	1.048436	0.30043	3.328	0.9537	3.175	0.31
0.32	0.325489	1.051638	0.30951	3.231	0.9511	3.072	0.32
0.33	0.336022	1.054946	0.31852	3.140	0.9479	2.976	0.33
0.34	0.346589	1.058359	0.32748	3.053	0.9447	2.885	0.34
0.35	0.357190	1.061878	0.33637	2.973	0.9416	2.800	0.35
0.36	0.367827	1.065503	0.34522	2.897	0.9385	2.719	0.36
0.37	0.378500	1.069234	0.35399	2.825	0.9353	2.642	0.37
0.38	0.389212	1.073073	0.36271	2.757	0.9319	2.569	0.38
0.39	0.399962	1.077019	0.37136	2.693	0.9285	2.500	0.39
0.40	0.410752	1.081072	0.37995	2.632	0.9250	2.434	0.40
0.41	0.421584	1.085234	0.38847	2.574	0.9215	2.372	0.41
0.42	0.432457	1.089504	0.39693	2.519	0.9178	2.312	0.42
0.43	0.443374	1.093883	0.40532	2.467	0.9141	2.256	0.43
0.44	0.454335	1.098372	0.41365	2.417	0.9103	2.201	0.44
0.45	0.465342	1.102970	0.42190	2.370	0.9066	2.149	0.45
0.46	0.476395	1.107679	0.43009	2.325	0.0925	2.099	0.46
0.47	0.487496	1.112498	0.43820	2.282	0.8988	2.051	0.47
0.48	0.498646	1.117429	0.44624	2.241	0.8949	2.006	0.48
0.49	0.509845	1.122471	0.45421	2.202	0.8909	1.961	0.49

Example. sinh 0.25 = 0.252612.

TABLE XV

REAL HYPERBOLIC FUNCTIONS. $f(x + io) = u + io$. CONTINUED

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
0.50	0.521095	1.127626	0.46211	2.164	0.8868	1.919	0.50
0.51	0.532398	1.132893	0.46995	2.128	0.8827	1.878	0.51
0.52	0.543754	1.138274	0.47769	2.093	0.8785	1.839	0.52
0.53	0.555164	1.143769	0.48538	2.060	0.8743	1.801	0.53
0.54	0.566629	1.149378	0.49299	2.028	0.8700	1.765	0.54
0.55	0.578152	1.155101	0.50052	1.998	0.8658	1.730	0.55
0.56	0.589732	1.160941	0.50797	1.969	0.8614	1.696	0.56
0.57	0.601371	1.166896	0.51536	1.940	0.8570	1.663	0.57
0.58	0.613070	1.172968	0.52266	1.913	0.8525	1.631	0.58
0.59	0.624831	1.179158	0.52990	1.887	0.8480	1.601	0.59
0.60	0.636654	1.185465	0.53704	1.862	0.8435	1.571	0.60
0.61	0.648540	1.191891	0.54413	1.838	0.8390	1.542	0.61
0.62	0.660492	1.198436	0.55112	1.814	0.8344	1.514	0.62
0.63	0.672509	1.205101	0.55805	1.792	0.8298	1.487	0.63
0.64	0.684594	1.211887	0.56490	1.770	0.8251	1.461	0.64
0.65	0.696748	1.218793	0.57166	1.749	0.8205	1.435	0.65
6.66	0.708970	1.225822	0.57836	1.729	0.8158	1.410	0.66
0.67	0.721264	1.232973	0.58498	1.709	0.8110	1.387	0.67
0.68	0.733630	1.240247	0.59152	1.690	0.8065	1.363	0.68
0.69	0.746070	1.247646	0.59798	1.672	0.8015	1.340	0.69
0.70	0.758584	1.255169	0.60437	1.655	0.7967	1.318	0.70
0.71	0.771174	1.262818	0.61067	1.637	0.7919	1.297	0.71
0.72	0.783840	1.270593	0.61691	1.621	0.7870	1.276	0.72
0.73	0.796586	1.278495	0.62306	1.605	0.7821	1.255	0.73
0.74	0.809411	1.286525	0.62914	1.590	0.7773	1.235	0.74
0.75	0.822317	1.294683	0.63516	1.5744	0.7724	1.216	0.75
0.76	0.835305	1.302971	0.64108	1.5599	0.7675	1.1972	0.76
0.77	0.848377	1.311390	0.64693	1.5457	0.7625	1.1787	0.77
0.78	0.861533	1.319939	0.65271	1.5320	0.7576	1.1607	0.78
0.79	0.874776	1.328621	0.65842	1.5188	0.7527	1.1431	0.79
0.80	0.888106	1.337435	0.66403	1.5059	0.7477	1.1259	0.80
0.81	0.901525	1.346383	0.66959	1.4934	0.7427	1.1092	0.81
0.82	0.915034	1.355466	0.67507	1.4813	0.7377	1.0928	0.82
0.83	0.928635	1.364684	0.68047	1.4696	0.7327	1.0768	0.83
0.84	0.942328	1.374039	0.68580	1.4582	0.7278	1.0612	0.84
0.85	0.956116	1.383531	0.69107	1.4470	0.7228	1.0459	0.85
0.86	0.969999	1.393161	0.69626	1.4362	0.7178	1.0309	0.86
0.87	0.983980	1.402931	0.70137	1.4258	0.7128	1.0163	0.87
0.88	0.998058	1.412841	0.70642	1.4156	0.7078	1.0020	0.88
0.89	1.012237	1.422893	0.71139	1.4057	0.7028	0.9881	0.89
0.90	1.026517	1.433086	0.71629	1.3961	0.6978	0.9737	0.90
0.91	1.040899	1.443423	0.72114	1.3867	0.6928	0.9607	0.91
0.92	1.055386	1.453905	0.72591	1.3776	0.6878	0.9475	0.92
0.93	1.069978	1.464531	0.73060	1.3687	0.6828	0.9346	0.93
0.94	1.084677	1.475305	0.73522	1.3600	0.6778	0.9219	0.94
0.95	1.099484	1.486225	0.73979	1.3518	0.6728	0.9095	0.95
0.96	1.114402	1.497295	0.74427	1.3436	0.6678	0.8973	0.96
0.97	1.129431	1.508514	0.74870	1.3356	0.6629	0.8854	0.97
0.98	1.144573	1.519884	0.75306	1.3279	0.6579	0.8737	0.98
0.99	1.159829	1.531406	0.75736	1.3204	0.6529	0.8621	0.99

Example. $\cosh 0.55 = 1.155101$.

Table XV

REAL HYPERBOLIC FUNCTIONS. $f(x + io) = u + io$. Continued

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
1.00	1.175201	1.543081	0.76159	1.3130	0.6480	0.8509	1.00
1.01	1.190691	1.554910	0.76576	1.3059	0.6431	0.8395	1.01
1.02	1.206300	1.566895	0.76987	1.2989	0.6382	0.8290	1.02
1.03	1.222029	1.579036	0.77391	1.2921	0.6333	0.8183	1.03
1.04	1.237881	1.591336	0.77789	1.2855	0.6284	0.8078	1.04
1.05	1.253857	1.603794	0.78181	1.2791	0.6235	0.7975	1.05
1.06	1.269958	1.616413	0.78566	1.2728	0.6186	0.7874	1.06
1.07	1.286185	1.629194	0.78946	1.2666	0.6138	0.7777	1.07
1.08	1.302542	1.642138	0.79320	1.2607	0.6090	0.7677	1.08
1.09	1.319029	1.655245	0.79688	1.2549	0.6042	0.7581	1.09
1.10	1.335647	1.668519	0.80050	1.2492	0.5993	0.7487	1.10
1.11	1.352400	1.681959	0.80406	1.2437	0.5945	0.7393	1.11
1.12	1.369287	1.695567	0.80757	1.2382	0.5898	0.7302	1.12
1.13	1.386312	1.709345	0.81102	1.2330	0.5850	0.7215	1.13
1.14	1.403475	1.723294	0.81441	1.2279	0.5803	0.7125	1.14
1.15	1.420778	1.737415	0.81775	1.2229	0.5755	0.7038	1.15
1.16	1.438224	1.751710	0.82104	1.2180	0.5708	0.6953	1.16
1.17	1.455813	1.766180	0.82427	1.2132	0.5662	0.6869	1.17
1.18	1.473548	1.780826	0.82745	1.2085	0.5616	0.6786	1.18
1.19	1.491430	1.795651	0.83058	1.2040	0.5569	0.6705	1.19
1.20	1.509461	1.810656	0.83365	1.1995	0.5523	0.6625	1.20
1.21	1.527644	1.825841	0.83668	1.1952	0.5477	0.6546	1.21
1.22	1.545979	1.841209	0.83965	1.1910	0.5431	0.6468	1.22
1.23	1.564468	1.856761	0.84258	1.1868	0.5385	0.6392	1.23
1.24	1.583115	1.872499	0.84546	1.1828	0.5340	0.6317	1.24
1.25	1.601919	1.888424	0.84828	1.1789	0.5296	0.6242	1.25
1.26	1.620884	1.904538	0.85106	1.1750	0.5251	0.6170	1.26
1.27	1.640010	1.920842	0.85380	1.1712	0.5206	0.6098	1.27
1.28	1.659301	1.937339	0.85648	1.1675	0.5162	0.6026	1.28
1.29	1.678758	1.954029	0.85913	1.1640	0.5118	0.5957	1.29
1.30	1.698382	1.970914	0.86172	1.1605	0.5074	0.5888	1.30
1.31	1.718177	1.987997	0.86428	1.1570	0.5030	0.5820	1.31
1.32	1.738143	2.005278	0.86678	1.1537	0.4987	0.5753	1.32
1.33	1.758283	2.022760	0.86925	1.1504	0.4944	0.5687	1.33
1.34	1.778599	2.040445	0.87167	1.1472	0.4901	0.5623	1.34
1.35	1.799093	2.058333	0.87405	1.1441	0.4858	0.5559	1.35
1.36	1.819766	2.076427	0.87639	1.1410	0.4816	0.5495	1.36
1.37	1.840622	2.094729	0.87869	1.1380	0.4773	0.5433	1.37
1.38	1.861662	2.113240	0.88095	1.1351	0.4732	0.5372	1.38
1.39	1.882887	2.131963	0.88317	1.1323	0.4690	0.5311	1.39
1.40	1.904302	2.150898	0.88535	1.1295	0.4649	0.5252	1.40
1.41	1.925906	2.170049	0.88749	1.1268	0.4608	0.5192	1.41
1.42	1.947703	2.189417	0.88960	1.1241	0.4568	0.5134	1.42
1.43	1.969695	2.209004	0.89167	1.1215	0.4527	0.5077	1.43
1.44	1.991884	2.228812	0.89370	1.1189	0.4486	0.5020	1.44
1.45	2.014272	2.248842	0.89569	1.1165	0.4446	0.4964	1.45
1.46	2.036862	2.269098	0.89765	1.1140	0.4407	0.4909	1.46
1.47	2.059655	2.289580	0.89958	1.1116	0.4367	0.4855	1.47
1.48	2.082654	2.310292	0.90147	1.1093	0.4329	0.4802	1.48
1.49	2.105861	2.331234	0.90332	1.1070	0.4290	0.4749	1.49

Example. tanh 1.25 = 0.84828.

Table XV

REAL HYPERBOLIC FUNCTIONS. $f(x + io) = u + io$. Continued

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
1.50	2.129279	2.352410	0.90515	1.1048	0.4251	0.4697	1.50
1.51	2.152910	2.373820	0.90694	1.1026	0.4212	0.4645	1.51
1.52	2.176757	2.395469	0.90870	1.1005	0.4174	0.4594	1.52
1.53	2.200821	2.417356	0.91042	1.0984	0.4137	0.4543	1.53
1.54	2.225105	2.439486	0.91212	1.0963	0.4099	0.4494	1.54
1.55	2.249611	2.461859	0.91379	1.0944	0.4062	0.4444	1.55
1.56	2.274343	2.484479	0.91542	1.0924	0.4025	0.4398	1.56
1.57	2.299302	2.507347	0.91703	1.0905	0.3988	0.4350	1.57
1.58	2.324490	2.530465	0.91860	1.0886	0.3952	0.4302	1.58
1.59	2.349912	2.553837	0.92015	1.0868	0.3916	0.4255	1.59
1.60	2.375568	2.577464	0.92167	1.0850	0.3879	0.4209	1.60
1.61	2.401462	2.601349	0.92316	1.0832	0.3844	0.4164	1.61
1.62	2.427596	2.625495	0.92462	1.0815	0.3809	0.4119	1.62
1.63	2.453973	2.649902	0.92606	1.0798	0.3774	0.4075	1.63
1.64	2.480595	2.674575	0.92747	1.0782	0.3739	0.4031	1.64
1.65	2.507465	2.699515	0.92886	1.0766	0.3704	0.3988	1.65
1.66	2.534586	2.724725	0.93022	1.0750	0.3670	0.3945	1.66
1.67	2.561960	2.750207	0.93155	1.0735	0.3636	0.3903	1.67
1.68	2.589591	2.775965	0.93286	1.0719	0.3602	0.3862	1.68
1.69	2.617481	2.802000	0.93415	1.0704	0.3569	0.3820	1.69
1.70	2.645632	2.828315	0.93541	1.0691	0.3536	0.3780	1.70
1.71	2.674048	2.854914	0.93665	1.0676	0.3503	0.3740	1.71
1.72	2.702731	2.881797	0.93786	1.0662	0.3470	0.3700	1.72
1.73	2.731685	2.908969	0.93906	1.0649	0.3438	0.3661	1.73
1.74	2.760912	2.936432	0.94023	1.0636	0.3405	0.3622	1.74
1.75	2.790414	2.964188	0.94138	1.0623	0.3373	0.3584	1.75
1.76	2.820196	2.992241	0.94250	1.0610	0.3342	0.3546	1.76
1.77	2.850260	3.020593	0.94361	1.0597	0.3310	0.3508	1.77
1.78	2.880609	3.049247	0.94470	1.0585	0.3279	0.3471	1.78
1.79	2.911246	3.078206	0.94576	1.0573	0.3248	0.3435	1.79
1.80	2.942174	3.107473	0.94681	1.0562	0.3218	0.3399	1.80
1.81	2.973397	3.137051	0.94783	1.0550	0.3187	0.3363	1.81
1.82	3.004916	3.166942	0.94884	1.0539	0.3158	0.3328	1.82
1.83	3.036737	3.197150	0.94983	1.0528	0.3128	0.3293	1.83
1.84	3.068860	3.227678	0.95080	1.0517	0.3098	0.3258	1.84
1.85	3.101291	3.258528	0.95175	1.0507	0.3069	0.3224	1.85
1.86	3.134032	3.289705	0.95268	1.0497	0.3040	0.3191	1.86
1.87	3.167086	3.321210	0.95359	1.0487	0.3011	0.3157	1.87
1.88	3.200457	3.353047	0.95449	1.0477	0.2982	0.3125	1.88
1.89	3.234148	3.385220	0.95537	1.0467	0.2954	0.3092	1.89
1.90	3.268163	3.417732	0.95624	1.0458	0.2926	0.3059	1.90
1.91	3.302504	3.450585	0.95709	1.0448	0.2897	0.3028	1.91
1.92	3.337176	3.483783	0.95792	1.0439	0.2870	0.2997	1.92
1.93	3.372181	3.517329	0.95873	1.0430	0.2843	0.2965	1.93
1.94	3.407524	3.551227	0.95953	1.0422	0.2816	0.2935	1.94
1.95	3.443207	3.585481	0.96032	1.0413	0.2789	0.2904	1.95
1.96	3.479234	3.620093	0.96109	1.0405	0.2762	0.2874	1.96
1.97	3.515610	3.655067	0.96185	1.0397	0.2736	0.2844	1.97
1.98	3.552337	3.690406	0.96259	1.0389	0.2710	0.2815	1.98
1.99	3.589419	3.726115	0.96331	1.0380	0.2684	0.2786	1.99

Example. coth 1.70 = 1.0691.

Table XV

REAL HYPERBOLIC FUNCTIONS. $f(x + i0) = u + i0$. Continued

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
2.00	3.626860	3.762196	0.96403	1.0373	0.2658	0.2757	2.00
2.01	3.66466	3.79865	0.96473	1.0365	0.2632	0.2729	2.01
2.02	3.70283	3.83549	0.96541	1.0358	0.2607	0.2701	2.02
2.03	3.74138	3.87271	0.96608	1.0351	0.2582	0.2673	2.03
2.04	3.78029	3.91032	0.96675	1.0344	0.2557	0.2645	2.04
2.05	3.81958	3.94832	0.96740	1.0337	0.2533	0.2618	2.05
2.06	3.85926	3.98671	0.96803	1.0330	0.2508	0.2596	2.06
2.07	3.89932	4.02550	0.96865	1.0323	0.2484	0.2565	2.07
2.08	3.93977	4.06470	0.96926	1.0317	0.2460	0.2538	2.08
2.09	3.98061	4.10430	0.96986	1.0310	0.2436	0.2512	2.09
2.10	4.02186	4.14431	0.97045	1.0305	0.2413	0.2486	2.10
2.11	4.06350	4.18474	0.97103	1.0298	0.2389	0.2461	2.11
2.12	4.10555	4.22558	0.97159	1.0293	0.2366	0.2436	2.12
2.13	4.14801	4.26685	0.97215	1.0286	0.2344	0.2411	2.13
2.14	4.19089	4.30855	0.97269	1.0280	0.2321	0.2386	2.14
2.15	4.23419	4.35067	0.97323	1.0275	0.2298	0.2362	2.15
2.16	4.27791	4.39323	0.97375	1.0269	0.2276	0.2338	2.16
2.17	4.32205	4.43623	0.97426	1.0264	0.2254	0.2314	2.17
2.18	4.36663	4.47967	0.97477	1.0259	0.2232	0.2290	2.18
2.19	4.41165	4.52356	0.97526	1.0254	0.2211	0.2267	2.19
2.20	4.45711	4.56791	0.97574	1.0249	0.2189	0.2244	2.20
2.21	4.50301	4.61271	0.97622	1.0243	0.2168	0.2221	2.21
2.22	4.54936	4.65797	0.97668	1.0239	0.2147	0.2198	2.22
2.23	4.59617	4.70370	0.97714	1.0234	0.2126	0.2176	2.23
2.24	4.64344	4.74989	0.97758	1.0229	0.2105	0.2154	2.24
2.25	4.69117	4.79657	0.97803	1.0225	0.2085	0.2132	2.25
2.26	4.73937	4.84372	0.97847	1.0220	0.2064	0.2110	2.26
2.27	4.78804	4.89136	0.97888	1.0216	0.2044	0.2089	2.27
2.28	4.83720	4.93948	0.97929	1.0211	0.2024	0.2067	2.28
2.29	4.88683	4.98810	0.97970	1.0207	0.2005	0.2047	2.29
2.30	4.93696	5.03722	0.98010	1.0203	0.1985	0.2026	2.30
2.31	4.98758	5.08684	0.98049	1.0199	0.1966	0.2005	2.31
2.32	5.03870	5.13697	0.98087	1.0195	0.1947	0.1985	2.32
2.33	5.09032	5.18762	0.98124	1.0191	0.1928	0.1965	2.33
2.34	5.14245	5.23879	0.98161	1.0187	0.1909	0.1945	2.34
2.35	5.19510	5.29047	0.98198	1.0184	0.1890	0.1925	2.35
2.36	5.24827	5.34269	0.98233	1.0180	0.1872	0.1905	2.36
2.37	5.30196	5.39544	0.98268	1.0177	0.1854	0.1886	2.37
2.38	5.35618	5.44873	0.98302	1.0173	0.1835	0.1867	2.38
2.39	5.41093	5.50256	0.98335	1.0169	0.1817	0.1848	2.39
2.40	5.46623	5.55695	0.98368	1.0166	0.1800	0.1829	2.40
2.41	5.52207	5.61189	0.98399	1.0163	0.1782	0.1811	2.41
2.42	5.57847	5.66739	0.98431	1.0159	0.1765	0.1793	2.42
2.43	5.63542	5.72346	0.98462	1.0156	0.1747	0.1775	2.43
2.44	5.69294	5.78010	0.98492	1.0153	0.1730	0.1757	2.44
2.45	5.75103	5.83732	0.98522	1.0150	0.1713	0.1739	2.45
2.46	5.80969	5.89512	0.98551	1.0147	0.1696	0.1721	2.46
2.47	5.86893	5.95352	0.98579	1.0144	0.1680	0.1704	2.47
2.48	5.92876	6.01250	0.98607	1.0141	0.1663	0.1687	2.48
2.49	5.98918	6.07209	0.98635	1.0138	0.1647	0.1670	2.49

Example. sech 2.00 = 0.2658.

TABLE XV

REAL HYPERBOLIC FUNCTIONS. $f(x + io) = u + io$. CONTINUED

θ	Sinh θ	Cosh θ	Tanh θ	Coth θ	Sech θ	Cosech θ	θ
2.5	6.05020	6.13229	0.98661	1.0136	0.1631	0.1653	2.5
2.6	6.69473	6.76901	0.98903	1.0111	0.1477	0.1494	2.6
2.7	7.40626	7.47347	0.99101	1.0091	0.1338	0.1350	2.7
2.8	8.19192	8.25273	0.99263	1.0074	0.1212	0.1221	2.8
2.9	9.05956	9.11458	0.99396	1.0061	0.1097	0.1104	2.9
3.0	10.01787	10.06766	0.99505	1.0050	0.0937	0.09982	3.0
3.1	11.07645	11.12150	0.99595	1.0041	0.0899	0.0903	3.1
3.2	12.24588	12.28665	0.99668	1.0033	0.0814	0.0816	3.2
3.3	13.53788	13.57476	0.99728	1.0027	0.0736	0.0739	3.3
3.4	14.96536	14.99874	0.99778	1.0022	0.0667	0.0668	3.4
3.5	16.54263	16.57282	0.99818	1.0018	0.0604	0.0604	3.5
3.6	18.28546	18.31278	0.99851	1.0015	0.0546	0.0547	3.6
3.7	20.21129	20.23601	0.99878	1.0012	0.0494	0.0495	3.7
3.8	22.33941	22.36178	0.99900	1.0010	0.0447	0.0448	3.8
3.9	24.69110	24.71135	0.99918	1.0008	0.0405	0.0405	3.9
4.0	27.28992	27.30823	0.99933	1.0007	0.0366	0.0366	4.0
4.1	30.16186	30.17843	0.99945	1.0006	0.0331	0.0332	4.1
4.2	33.33567	33.35066	0.99955	1.0005	0.0300	0.0300	4.2
4.3	36.84311	36.85668	0.99963	1.0004	0.0271	0.0271	4.3
4.4	40.71930	40.73157	0.99970	1.0003	0.0245	0.0245	4.4
4.5	45.00301	45.01412	0.99975	1.0003	0.0222	0.0222	4.5
4.6	49.73713	49.74718	0.99980	1.0002	0.0201	0.0201	4.6
4.7	54.96904	54.97813	0.99983	1.0002	0.0182	0.0182	4.7
4.8	60.75109	60.75932	0.99986	1.0001	0.0165	0.0165	4.8
4.9	67.14117	67.14861	0.99989	1.0001	0.0149	0.0149	4.9
5.0	74.20321	74.20995	0.99991	1.0001	0.0135	0.0135	5.0
5.1	82.0079	82.0140	0.99993	1.00007	0.01219	0.01219	5.1
5.2	90.6334	90.6389	0.99993	1.00007	0.01103	0.01103	5.2
5.3	100.1659	100.1709	0.99994	1.00006	0.00998	0.00998	5.3
5.4	110.7009	110.7055	0.99995	1.00005	0.00903	0.00903	5.4
5.5	122.3439	122.3480	0.99996	1.00004	0.00818	0.00818	5.5
5.6	135.2114	135.2150	0.99997	1.00003	0.00740	0.00740	5.6
5.7	149.4320	149.4354	0.99998	1.00002	0.00669	0.00669	5.7
5.8	165.1483	165.1513	0.99998	1.00002	0.00606	0.00606	5.8
5.9	182.5174	182.5201	0.99998	1.00002	0.00548	0.00548	5.9
6.0	201.7132	201.7156	0.99999	1.00001	0.00496	0.00496	6.0
6.1	222.9278	222.9300	1.000	1.000	0.00449	0.00449	6.1
6.2	246.3735	246.3755	1.000	1.000	0.00406	0.00406	6.2
6.3	272.2850	272.2869	1.000	1.000	0.00367	0.00367	6.3
6.4	300.9217	300.9233	1.000	1.000	0.00332	0.00332	6.4
6.5	332.5701	332.5716	1.000	1.000	0.00301	0.00301	6.5
6.6	367.5469	367.5483	1.000	1.000	0.00272	0.00272	6.6
6.7	406.2023	406.2035	1.000	1.000	0.00246	0.00246	6.7
6.8	448.9231	448.9242	1.000	1.000	0.00223	0.00223	6.8
6.9	496.1369	496.1379	1.000	1.000	0.00202	0.00202	6.9
7.0	548.3161	548.3170	1.000	1.000	0.00182	0.00182	7.0
7.1	605.9831	605.9839	1.000	1.000	0.00165	0.00165	7.1
7.2	669.7150	669.7158	1.000	1.000	0.00149	0.00149	7.2
7.3	740.1496	740.1503	1.000	1.000	0.00135	0.00135	7.3
7.4	817.9919	817.9925	1.000	1.000	0.00122	0.00122	7.4
7.5	904.0209	904.0215	1.000	1.000	0.00111	0.00111	7.5

Example. cosech 2.50 = 0.1653.

°	′ ″	°	′ ″	°	′ ″	′	°	′	°	″	°
0.01	00.36	0.41	24.36	0.81	48.36	01	0.0167	41	0.6833	21	0.0058
0.02	01.12	0.42	25.12	0.82	49.12	02	0.0333	42	0.7000	22	0.0061
0.03	01.48	0.43	25.48	0.83	49.48	03	0.0500	43	0.7167	23	0.0064
0.04	02.24	0.44	26.24	0.84	50.24	04	0.0667	44	0.7333	24	0.0067
0.05	03.00	0.45	27.00	0.85	51.00	05	0.0833	45	0.7500	25	0.0069
0.06	03.36	0.46	27.36	0.86	51.36	06	0.1000	46	0.7667	26	0.0072
0.07	04.12	0.47	28.12	0.87	52.12	07	0.1167	47	0.7833	27	0.0075
0.08	04.48	0.48	28.48	0.88	52.48	08	0.1333	48	0.8000	28	0.0078
0.09	05.24	0.49	29.24	0.89	53.24	09	0.1500	49	0.8167	29	0.0081
0.10	06.00	0.50	30.00	0.90	54.00	10	0.1667	50	0.8333	30	0.0083
0.11	06.36	0.51	30.36	0.91	54.36	11	0.1833	51	0.8500	31	0.0086
0.12	07.12	0.52	31.12	0.92	55.12	12	0.2000	52	0.8667	32	0.0089
0.13	07.48	0.53	31.48	0.93	55.48	13	0.2167	53	0.8833	33	0.0092
0.14	08.24	0.54	32.24	0.94	56.24	14	0.2333	54	0.9000	34	0.0094
0.15	09.00	0.55	33.00	0.95	57.00	15	0.2500	55	0.9167	35	0.0097
0.16	09.36	0.56	33.36	0.96	57.36	16	0.2667	56	0.9333	36	0.0100
0.17	10.12	0.57	34.12	0.97	58.12	17	0.2833	57	0.9500	37	0.0103
0.18	10.48	0.58	34.48	0.98	58.48	18	0.3000	58	0.9667	38	0.0106
0.19	11.24	0.59	35.24	0.99	59.24	19	0.3167	59	0.9833	39	0.0108
0.20	12.00	0.60	36.00	1.00	60.00	20	0.3333	60	1.0000	40	0.0111
								″	°		
0.21	12.36	0.61	36.36	....	....	21	0.3500	01	0.0003	41	0.0114
0.22	13.12	0.62	37.12	....	....	22	0.3667	02	0.0006	42	0.0117
0.23	13.48	0.63	37.48	....	....	23	0.3833	03	0.0008	43	0.0119
0.24	14.24	0.64	38.24	....	....	24	0.4000	04	0.0011	44	0.0122
0.25	15.00	0.65	39.00	....	....	25	0.4167	05	0.0014	45	0.0125
0.26	15.36	0.66	39.36	....	....	26	0.4333	06	0.0017	46	0.0128
0.27	16.12	0.67	40.12	....	....	27	0.4500	07	0.0019	47	0.0131
0.28	16.48	0.68	40.48	....	....	28	0.4667	08	0.0022	48	0.0133
0.29	17.24	0.69	41.24	....	....	29	0.4833	09	0.0025	49	0.0136
0.30	18.00	0.70	42.00	....	....	30	0.5000	10	0.0028	50	0.0139
				°	′ ″						
0.31	18.36	0.71	42.36	0.001	00.03.6	31	0.5167	11	0.0031	51	0.0142
0.32	19.12	0.72	43.12	0.002	00.07.2	32	0.5333	12	0.0033	52	0.0144
0.33	19.48	0.73	43.48	0.003	00.10.8	33	0.5500	13	0.0036	53	0.0147
0.34	20.24	0.74	44.24	0.004	00.14.4	34	0.5667	14	0.0039	54	0.0150
0.35	21.00	0.75	45.00	0.005	00.18	35	0.5833	15	0.0042	55	0.0153
0.36	21.36	0.76	45.36	0.006	00.21.6	36	0.6000	16	0.0044	56	0.0156
0.37	22.12	0.77	46.12	0.007	00.25.2	37	0.6167	17	0.0047	57	0.0158
0.38	22.48	0.78	46.48	0.008	00.28.8	38	0.6333	18	0.0050	58	0.0161
0.39	23.24	0.79	47.24	0.009	00.32.4	39	0.6500	19	0.0053	59	0.0164
0.40	24.00	0.80	48.00	0.010	00.36	40	0.6667	20	0.0055	60	0.0167

Examples. $0°.41 = 0°.24'.36''$ $0°.41'.00'' = 0°.6833.$
$0°.005 = 0°.00'.18''$ $0°.00'.46'' = 0°.0128.$

EXPLANATORY TEXT

EXPLANATORY TEXT

INTRODUCTION

The Tables in this book are designed primarily for presenting hyperbolic functions of a complex variable either in the rectangular coördinate form of that variable $(x + iy)$ or the polar coördinate form $(\rho \angle \delta)$. They are also designed secondarily for presenting circular functions of a complex variable. A few formulas are added as aids to the conversion of such functions. The most extensive range offered is in Tables VII to XIV inclusive, between which, the functions $\sinh (x + iy)$, $\cosh (x + iy)$, $\tanh (x + iy)$, expressed in the result either in rectangular coördinates $u + iv$ or in polar coördinate quantities $r \angle \gamma$, may be obtained between the limits of 0 and $\pm$ 10 of x, and between the limits of 0 and $\pm \infty$ for y. It is shown, moreover, to be an easy matter to extend the range of x beyond the offered range of $\pm$ 10, should such an extension be required. The practical need for tabulated values of hyperbolic functions of $(x + iy)$ beyond the range of $x = \pm 10$ appears to be so small that any such extension is left to the reader.

As the author's applications for financial assistance in the computation of the Tables were unsuccessful, the steps in x and y (0.05 and 0.07854 respectively) are larger than were originally intended; *i.e.*, for reducing the work of the user to the lowest practicable limits. Consequently, interpolation must ordinarily be resorted to, when three or more significant digits are needed in the results. Such interpolations require an appreciable amount of time to effect in two dimensions; *i.e.*, for both x and y. In order to render such interpolation unnecessary for ordinary engineering purposes, where three, or at most four, significant digits may be needed, a separate atlas of 23 large-scale charts, 45 cm. $\times$ 45 cm. over ruled areas, has been prepared, and is published as an adjunct to these Tables. The necessary interpolation can very swiftly be made on the charts, by inspection.

COMPLEX QUANTITIES

The following brief outline of complex quantities is offered in view of their fundamental importance in connection with the Tables, for the assistance of those who have studied elementary mathematics, but who may not have become familiar with complex numbers. For a more comprehensive discussion of complex quantities, the reader must be referred to special treatises on the subject.

Ordinary numerical quantities, or the numbers dealt with in ordinary arithmetic, may be considered to range between zero and either positive or negative infinity, by indefinitely small gradations. Such numbers may be represented geometrically by distances, in either direction, from a zero point on an infinite straight line. Thus in Fig. 1, we may consider that the straight line $-XOX$ extends from minus infinity on the left, to plus infinity on the right, O being the zero point. The point x_1 would then represent $+1$, and so on. That is, the number $+1$ may be regarded as represented on the line $-XOX$ either by the position of the point x_1 with respect to the zero point O;

or, as the *vector* Ox_1; *i e.*, the straight line drawn from the origin O to the point x_1 and forming a part of the reference line $-XOX$. Under these assumptions, the ordinary numbers of arithmetic may be represented geometrically as vectors; but such vectors are confined to a single straight-line direction from O towards X for positive numbers, and from O towards $-X$ for negative numbers.

Complex quantities, or complex numbers, cannot be completely represented by reference to a single direction, or to vectors along one and the same straight line. They may, however, be represented geometrically by the position, in an infinite plane, of a movable point with respect to a fixed point as origin. Thus, in Fig. 1, the plane XOY is the plane of reference, and the fixed point O is the origin. Then any point P_1 in the plane represents a complex number, and any complex number may be represented by a point on the plane.

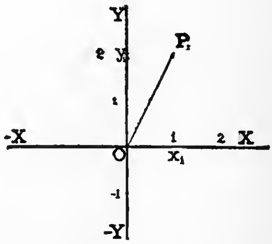

FIG. 1. — Complex quantity $1 + i\,2$.

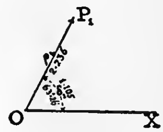

FIG. 2. — Plane Vector $2.236\,\epsilon^{i1.106}$ or $\rho\epsilon^{i\delta}$, designated by $2.236\,\underline{/63°.26'}$.

A coördinates, or in polar coördinates, as may be preferred. Thus, the same vector OP_1 is represented in Fig. 1 to rectangular coördinates, and in Fig. 2 to polar coördinates. In Fig. 1, the X axis $-XOX$ passing through the origin O is the fundamental reference axis, and the Y axis $-YOY$, perpendicular thereto in the reference plane, immediately follows. Then the point P_1, measuring $+1$ along OX, and $+2$ along OY, may be defined by the expression $(1 + i2)$, where the symbol i signifies measurement along the subordinate axis. It is shown in mathematical treatises that $i = \sqrt{-1}$. The vector OP_1 of Fig. 1 may therefore be expressed as $(1 + \sqrt{-1}.2)$ and a vector from O to any point in the plane may be represented by $x + \sqrt{-1}\,y = x + iy$, where x and y may have any positive or negative numerical values, including zero.

In pursuance of time-honored terminology, the axis $-XOX$ is sometimes called the "real" axis, and $-YOY$ the "imaginary," axis; so that the x-component of a complex number becomes the "real component," and the y-component the "imaginary component." The symbol i still stands for the *imaginary* component. In mathematics as applied to electrical engineering, the symbol i commonly designates electric current-strength, and so, in order to prevent the possibility of confusion, the symbol j is frequently substituted as the sign of the imaginary. Under such a convention, the plane-vector, or complex quantity, OP_1, would be represented as $1 + j\,2$. As, however, in this book we necessarily consider complex quantities from a broader viewpoint than that offered by electrical engineering, we shall use the symbol i to denote the imaginary component, perpendicularly rotated with respect to the fundamental X axis.

Complex quantities may also be expressed in polar coördinates, as in Fig. 2, where the fundamental reference axis OX is drawn in the positive direction in the reference plane, from the origin O, and the circular angle δ_1 is measured in the positive or counter-clockwise direction from OX to OP_1. The vector OP_1 is then specified in polar coördinates by its length ρ_1 and by its angle δ_1. The length ρ_1 is called the *modulus* of the vector, and the angle δ_1 is called the *argument*. This argument may be expressed in circular radians, in degrees-minutes-seconds, quadrants, or any other recognized unit of circular angle. Thus, in Fig. 2, the vector OP_1 may be represented to polar coördinates symbolically by $\rho_1 \underline{/\delta_1}$ or, using numbers, by $2.236 \underline{/63^\circ.26'}$, where 2.236 is the modulus to the same scale of linear measure as in Fig. 1, and $63^\circ.26'$ is the argument.

If one and the same complex quantity be expressed both in rectangular and polar coördinates, as follows:

$$x + iy = \rho \underline{/\delta} \qquad (1)$$

it is evident that $x = \rho \cos \delta$, $y = \rho \sin \delta$, $y/x = \tan \delta$, and $\rho = \sqrt{x^2 + y^2}$, relations which enable the coördinates to be changed, at will, from one form to the other. Thus in Figs 1 and 2, $x_1 = 1$, $y_1 = 2$, $\rho_1 = \sqrt{5} = 2.236$, and $\delta_1 = \tan^{-1}(2) = 63^\circ.26'$.

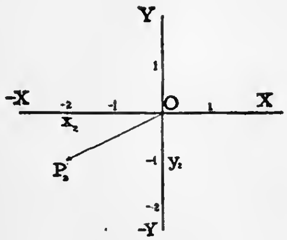

FIG. 3. — Complex quantity $-2 - i1$.

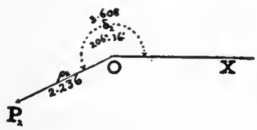

FIG. 4. — Plane-Vector $2.236\,\epsilon^{i3.608}$. or $2.236 \underline{/206^\circ.34'}$.

Similarly, Figs. 3 and 4 represent the complex quantity or plane vector OP_2 to rectangular and polar coördinates respectively. Here $x_2 = -2$, $y_2 = -1$, $\rho_2 = \sqrt{5} = 2.236$ and $\delta_2 = 206^\circ.34'$.

ADDITION OF COMPLEX QUANTITIES

One vector quantity is added to another, by drawing it in the reference plane from the extremity of the latter as origin, and then drawing a vector from the origin to its

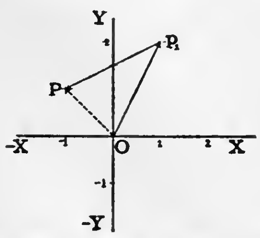

FIG. 5. — Addition of two complex quantities $(1 + i2) + (-2 - i1) = -1 + i1$.

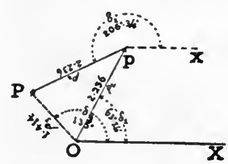

FIG. 6. — Complex Addition, Polar coördinates.

$\rho_1 \underline{/\delta_1} + \rho_2 \underline{/\delta_2} = \rho_3 \underline{/\delta_3}$

$2.236 \underline{/63^\circ.26'} + 2.236 \underline{/206^\circ.34'} = 1.414 \underline{/135^\circ}$

Op + pP = OP

free end. The last named vector is the required sum. Thus, in Fig. 5, the complex quantity $OP_2 = -2 - i1$ of Fig 3 is added to the complex quantity $OP_1 = 1 + i2$

of Fig 1, giving the resultant vector $OP = -1 + i1$. Fig. 6 shows the corresponding operation with polar coördinate vectors. Here $OP_2 = 2.236 \underline{/206°.34'}$ of Fig. 4 is added to $OP_1 = 2.236 \underline{/63°.26'}$ of Fig. 2, to produce $OP = 1.414 \underline{/135°} = \rho_3 \underline{/\delta_3}$ of Fig. 6.

On the drawing-board, the graphic process of adding vectors is as easily effected when they are expressed in polar as in rectangular coördinates. But the arithmetical addition is much more easily made with rectangular coördinates. The rule is: find the vector sum by taking first the sum of the reals, and then the sum of the imaginaries; or

$$(x_1 + iy_1) + (x_2 + iy_2) + \ldots + (x_n + iy_n) = (x_1 + x_2 + \ldots + x_n) + i(y_2 + y_2 + \ldots + y_n) = \Sigma x + i\Sigma y. \quad (2)$$

In the case of Figs. 5 and 6:

$$(1 + i2) + (-2 - i1) = (+1 - 2) + i(2 - 1) = -1 + i1 = \sqrt{2}\,\underline{/135°}.$$

Subtraction of Complex Quantities

Reversing the sign of a rectangular complex quantity means reversing the sign of both its real and imaginary components. Reversing the sign of a polar complex quantity means changing its argument by 180°.

To subtract one complex quantity A from another B, reverse the sign of A, and then add it thus reversed to B, by the rules of addition.

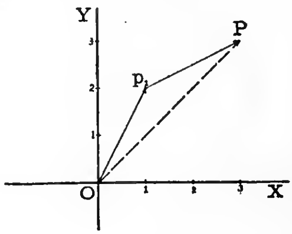

Fig. 7. — Complex Subtraction
$(1 + i2) - (-2 - i1) \ldots 3 + i3 = OP.$

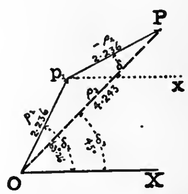

Fig. 8. — Complex Subtraction, Polar Coördinates
$\rho_1 \underline{/\delta_1} - \rho_2 \underline{/\delta_2} = \rho_3 \underline{/\delta_3}$
$2.236 \underline{/63°.26'} - 2.236 \underline{/206°.34'} = 4.243 \underline{/45°}$
$Op_1 + p_1P = OP.$

In Figs. 7 and 8, the vector P_2 of Figs. 3 and 4 is subtracted from the vector P_1 of Figs. 1 and 2. In Fig. 7, we have

$$\begin{aligned} OP_1 - OP_2 &= OP. \\ (1 + i2) - (-2 - i1) &= (1 + i2) + (2 + i1). \\ &= 3 + i3. \end{aligned}$$

In Fig. 8,

$$\begin{aligned} \rho_1 \underline{/\delta_1} - \rho_2 \underline{/\delta_2} &= \rho_3 \underline{/\delta_3} \\ 2.236 \underline{/63°.26'} - 2.236 \underline{/206°.34'} &= 2.236 \underline{/63°.26'} + 2.236 \underline{/26°.34'}. \\ &= 4.243 \underline{/45°}. \end{aligned}$$

Here again the process of complex subtraction, which is only a slight modification of complex addition, is very easily made on the drawing board by purely geometric processes, whether the quantities are rectangular or polar. If, however, the process is to be conducted algebraically, it is much more easily conducted with rectangular coördinates.

Multiplication of Complex Quantities

Two rectangular complex quantities may be multiplied algebraically by the ordinary rules of algebra, remembering that $i^2 = -1$. Thus

$$(x_1 + iy_1)(x_2 + iy_2) = (x_1 x_2 - y_1 y_2) + i(x_1 y_2 + x_2 y_1). \qquad (3)$$

In Fig. 9, the vector OP_1 of Figs. 1 and 2 is multiplied by the vector OP_2 of Figs. 3 and 4. The product is the broken line OP_3.

$$\text{For } (1 + i2) \times (-2 - i1) = (-2 + 2) - i(1 + 4) = -i5.$$

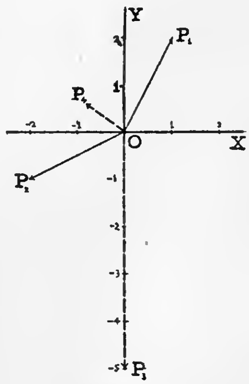

Fig. 9. — Product and Quotient of Complex Quantities Rectangular Coördinates
$(1 + i2) \times (-2 - i1) = -i5 = OP_3$
$(-2 + i1) \div (+1 + i2) = -0.8 + i0.6 = OP_4$

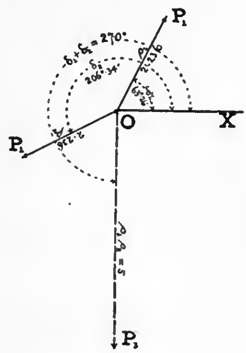

Fig. 10. — Product of two Complex Quantities, Polar Coördinates
$2.236 \underline{/63^\circ.26'} \times 2.236 \underline{/206^\circ.34'} = 5 \underline{/270^\circ} = OP_3$

If the two quantities to be multiplied are polar; then

$$\rho_1 \underline{/\delta_1} \times \rho_2 \underline{/\delta_2} = \rho_1 \rho_2 \underline{/\delta_1 + \delta_2}. \qquad (4)$$

Or the rule is form the product of the moduli and add the arguments. Thus in Fig. 10, $OP_1 = \sqrt{5}\underline{/63^\circ.26'}$ and $OP_2 = \sqrt{5}\underline{/206^\circ.34'}$ $\therefore$ $OP_3 = 5\underline{/270^\circ.00'}$.

Reciprocal of a Complex Quantity

The reciprocal of a rectangular complex quantity can be reduced to the standard algebraic form, by multiplying both numerator and denominator by the same complex quantity with reversed imaginary. Thus:

$$\frac{1}{x + iy} = \frac{1 \times (x - iy)}{(x + iy)(x - iy)} = \frac{x - iy}{x^2 + y^2} = \left(\frac{x}{x^2 + y^2}\right) - i\left(\frac{y}{x^2 + y^2}\right). \qquad (5)$$

For example if $x + iy = 1 + i2$,

$$\frac{1}{1 + i2} = \frac{1}{1 + i2}\left(\frac{1 - i2}{1 - i2}\right) = \frac{1 - i2}{1 + 4} = \frac{1}{5} - \frac{i2}{5} = 0.2 - i0.4.$$

The reciprocal of a polar complex quantity is obtained by taking the reciprocal of its modulus, and reversing its argument. That is

$$\frac{1}{\rho \underline{/\delta}} = \frac{1}{\rho}\underline{/-\delta} = \frac{1}{\rho}\overline{\backslash\delta}. \qquad (6)$$

For example:

$$\frac{1}{\sqrt{5}\,\underline{/63^\circ.26'}} = \frac{1}{\sqrt{5}}\,\overline{\backslash 63^\circ.26'}.$$

Quotient of Complex Quantities

To find the quotient of a complex quantity A divided by another B, form the reciprocal of B and then multiply this reciprocal by A.

Thus to find $(x_1 + iy_1)/(x_2 + iy_2)$

$$\frac{x_1 + iy_1}{x_2 + iy_2} = \frac{x_1 + iy_1}{x_2 + iy_2}\left(\frac{x_2 - iy_2}{x_2 - iy_2}\right) = \frac{(x_1x_2 + y_1y_2) + i(y_1x_2 - y_2x_1)}{x_2^2 + y_2^2}. \tag{7}$$

For example:

$$\frac{OP_2}{OP_1} = \frac{-2 - i1}{1 + i2} = \frac{-2 - i1}{1 + i2}\left(\frac{1 - i2}{1 - i2}\right)$$
$$= \frac{(-2 - 2) + i(4 - 1)}{1 + 4} = \frac{-4 + i3}{5} = -0.8 + i\,0.6.$$

Thus, in Fig. 9, $\dfrac{OP_2}{OP_1} = OP_4.$

The quotient of two polar complex quantities is formed by taking the quotient of their moduli and the difference of their arguments. That is

$$\frac{\rho_2\,\underline{/\delta_2}}{\rho_1\,\underline{/\delta_1}} = \frac{\rho_2}{\rho_1}\,\underline{/\delta_2 - \delta_1}. \tag{8}$$

Thus in Fig. 11 we have the quotient of OP_2 of Figs. 3 and 4 divided by OP_1 of Figs. 1 and 2, or

$$\frac{\sqrt{5}\,\underline{/206^\circ.34'}}{\sqrt{5}\,\underline{/63^\circ.26'}} = 1\,\underline{/143^\circ.08'}.$$

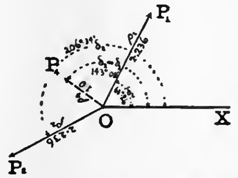

Fig. 11. — Quotient of two Complex Quantities, Polar Coördinates.
$2.236\,\underline{/206^\circ.34'} \div 2.236\,\underline{/63^\circ.26'} = 1.0\,\underline{/143^\circ.08'} = OP_4$
$\rho_2\,\underline{/\delta_2} \div \rho_1\,\underline{/\delta_1} = \rho_4\,\underline{/\delta_2 - \delta_1}$

It is thus evident that in order to find either the sums or the differences of complex quantities, it is desirable to have them expressed in rectangular coördinates; while, on the other hand, in order to find products, reciprocals, or quotients, it is preferable to have them expressed in polar coördinates.

Powers and Roots of Complex Quantities

It will be evident from the foregoing that

$$(\rho \underline{/\delta})^n = \rho^n \underline{/n\delta}: \text{ and } \sqrt[n]{\rho \underline{/\delta}} = \sqrt[n]{\rho} \underline{/\delta/n} \qquad (9)$$

operations that are readily executed on polar complex quantities.

Circular and Hyperbolic Functions Geometrically Compared

Since the Tables in this book are adapted for the evaluation of both circular and hyperbolic functions of a complex variable; that is, either of sin $(x + iy)$, cos $(x + iy)$ and tan $(x + iy)$; or of sinh $(x + iy)$, cosh $(x + iy)$ and tanh $(x + iy)$, it may be advisable to consider some propositions in the comparative geometry of the circular and hyperbolic functions, both real and complex.

Real Circular and Hyperbolic Functions

The geometry of the real circular functions sin x, cos x and tan x relates, as is well known, to the motion of a radius vector over a circle. The geometry of the real hyperbolic functions sinh x, cosh x and tanh x relates to the motion of a radius vector over a rectangular hyperbola. In Fig. 12, $A\ b\ c\ d\ E\ g$ is a circle $x^2 + y^2 = 1$, assumed to have unit radius, and center O. As the radius vector OA rotates in the positive or counterclockwise direction about the center O, it describes a circular sector such as AOE, and a circular angle β, the tangent Ef being always perpendicular to the radius vector OE. The magnitude of the circular angle β may be defined in either of two ways, namely: —

(1) By the ratio of the circular arc length s described during the motion, by the vector's terminal E, to the constant length ρ of the radius vector.

(2) By the area of the circular sector AOE swept out by the radius vector during the motion.

According to definition (1), if the radius vector generates any infinitesimal angle $d\beta$ circular radians, by moving its terminal over an infinitesimally small circular arc ds

then $$d\beta = \frac{ds}{\rho} = \frac{ds}{1} \qquad \text{circular radians (10)}$$

since the constant radius vector ρ has been taken equal to unity Consequently, in passing over any circular arc from distance s_1 to distance s_2, through a distance $s_2 - s_1 = s$, the total circular sector and circular angle generated will of course be: —

$$\beta = \int_{s_1}^{s_2} \frac{ds}{1} = (s_2 - s_1) = s \qquad \text{circular radians (11)}$$

or the angle β, as is well known, becomes equal to the length of the circular arc described, when expressed in circular radians.

According to definition (2), if in Fig. 12, the radius vector of unit length moves from the initial position OA to any position such as OE, it will sweep out a circular sector OEA.

If the arc AE^1 be measured in the negative or clockwise direction equal in length to the arc AE, then it is well known that the area of the double sector EOE^1 shaded in Fig. 12, is equal to β units of area because the area of the whole circle is manifestly π units, and the shaded area is $\frac{2\beta}{2\pi}$ that of the whole circle. Consequently, the magnitude of the angle β expressed in circular radians is numerically twice the area of the circular sector AOE which it covers when the circle has unit radius.

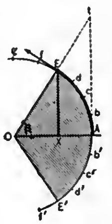

Fig. 12. — Circular Sector and Real Circular Functions.

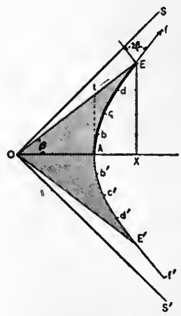

Fig. 13. — Hyperbolic Sector and Real Hyperbolic Functions.

Turning now to the hyperbolic case, let $A\ b\ c\ d\ E$ Fig. 13, be an arc of a rectangular hyperbola $x^2 - y^2 = 1$, assumed to have unit semi-diameter OA, and center O. As the radius vector OA rotates in the positive or counterclockwise direction with center O, it describes a hyperbolic sector AOE^1, and also what may conventionally be called for convenience a "hyperbolic angle" θ.* The tangent Ef to the path of the moving terminal E always makes a circular angle β with the Y axis; or a circular angle of 2β with a perpendicular to the radius vector. The magnitude of the hyperbolic angle θ may be defined in either of two ways; namely: —

(1) By the ratio of the hyperbolic arc length s described during the motion, by the terminal E, to the integrated mean length of the varying radius vector.

(2) By the area of the hyperbolic sector AOE Fig. 13, swept out by the radius vector during the motion.†

According to definition (1), if the variable radius vector ρ generates any infinitesimal hyperbolic angle $d\theta$ by moving its terminal over an infinitesimally small hyperbolic arc ds; then ‡

$$d\theta = \frac{ds}{\rho} \qquad \text{hyperbolic radians} \qquad (12)$$

* It should be pointed out that a "hyperbolic angle" in the sense above defined is not the opening between two lines intersecting in a plane; but a quantity otherwise analogous to a circular angle, and the argument x of the functions $\sinh x$, $\cosh x$, $\tanh x$, etc. The use of the term "hyperbolic angle" can only be justified by its convenience of analogy.

† Greenhill's "Differential and Integral Calculus," 1896, p. 108.

‡ A demonstration of this proposition has been given by the author in "The Application of Hyperbolic Functions to Electrical Engineering Problems." Appendix L, p. 250. University of London Press, 1911.

Consequently, in passing over any hyperbolic arc from distance s_1 to distance s_2 through a distance $s_2 - s_1 = s$, the total hyperbolic sector and hyperbolic angle generated will be

$$\theta = \int_{s_1}^{s_2} \frac{ds}{\rho} = \frac{s}{\rho^1} \qquad \text{hyperbolic radians} \qquad (13)$$

where ρ^1 is the integrated mean value of ρ as defined by the last equation. Any infinitesimally small angle, whether circular or hyperbolic, is therefore expressed in corresponding radian measure by one and the same term ds/ρ; but whereas, in the case of circular angles, the constancy of the radius vector makes the integral simply s/ρ, in the case of hyperbolic angles, the variation of the radius vector makes the integral more complex. Fig. 14 represents a circular angle of 1 radian in five sections of 0.2 radian each; while Fig. 15 represents a hyperbolic angle of 1 radian correspondingly divided. The integrated mean radius vector of the full sector *AOF* intersects the curve in the point *f*, the total length of the arc *A B C D E F* being 1.3167 units.

Sines, Cosines and Tangents of Circular and Hyperbolic Angles

If, with unit radius, we draw both a circular and a rectangular hyperbolic sector, as in Figs. 12 and 13, and take *OA* as the initial line in each; then for any position

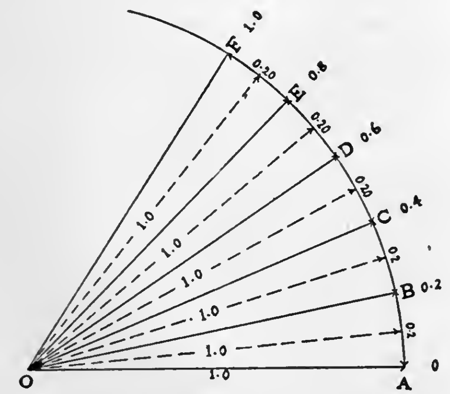

Fig. 14. — Circular Sector of 1 Radian Subdivided into Five Sectors of 0.2 Radian each.

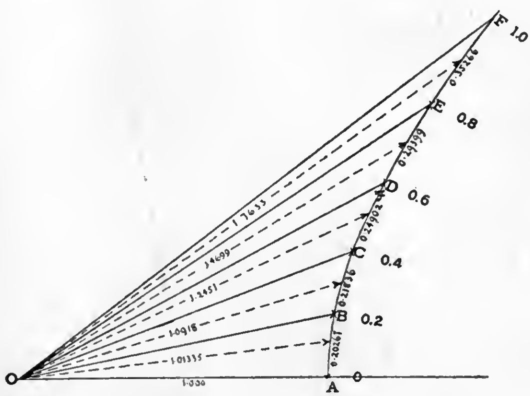

Fig. 15. — Hyperbolic Sector of 1 Radian Subdivided into Five Sectors each of 0.2 Radian.

of the radius vector such as *OE*, we shall have in either case the following magnitude conditions: —

The sine will be equal to the length of the perpendicular from the terminal of the radius vector on to the *X* axis.

The cosine will be equal to the length of the intercept on the *X* axis made by the above-mentioned perpendicular.

The versed sine will be equal to the length *XA*, Fig. 12, and *AX*, Fig. 13, between the intercept on the *X* axis, and the horizontal unit radius.

The tangent will be equal to the length of the perpendicular from the radius vector (or radius vector produced) on to unit radius point of the X axis. Thus in

Fig. 12, $\sin\beta = XE.$
Fig. 13, $\sinh\theta = XE.$
Fig. 12, $\cos\beta = OX.$
Fig. 13, $\cosh\theta = OX.$
Fig. 12, $\tan\beta = At.$
Fig. 13, $\tanh\theta = At.$

Whereas the values of $\sin\beta$, $\cos\beta$ and $\tan\beta$ fluctuate periodically in sign as β increases from 0 to ∞, the values of $\sinh\theta$, $\cosh\theta$, and $\tanh\theta$ do not change sign, the graphs of the real hyperbolic functions being indicated in Fig. 16, as far as $\theta = 3.0$.

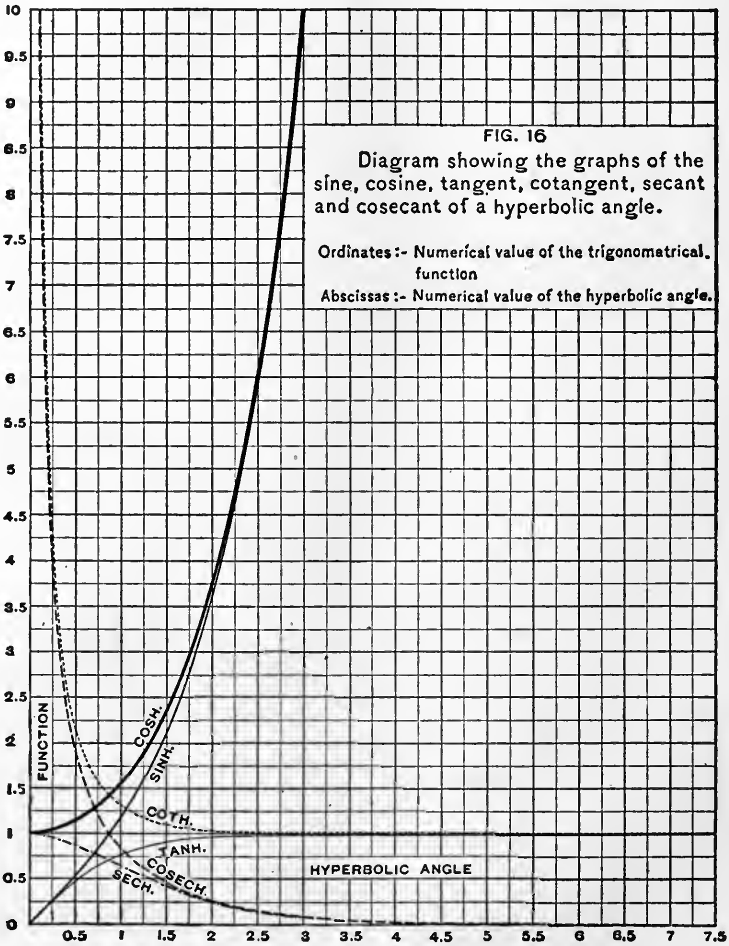

FIG. 16

Diagram showing the graphs of the sine, cosine, tangent, cotangent, secant and cosecant of a hyperbolic angle.

Ordinates :- Numerical value of the trigonometrical function

Abscissas :- Numerical value of the hyperbolic angle.

BISECTION OF CIRCULAR AND HYPERBOLIC ANGLES

If we take any circular angle *BOC* Fig. 17, we may of course bisect this angle in either of two ways: —

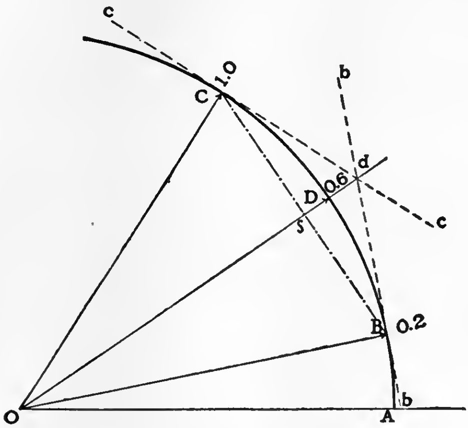

FIG. 17. — Bisection of a circular sector in the well-known manner by a radius vector through the intersection of terminal tangents, or through the midpoint of the chord between terminal points.

(1) By drawing tangents *bb*, *cc*, to the curve at the points *B*, *C*, respectively, and drawing the straight line *Od* from the center *O* through the point of intersection *d*.

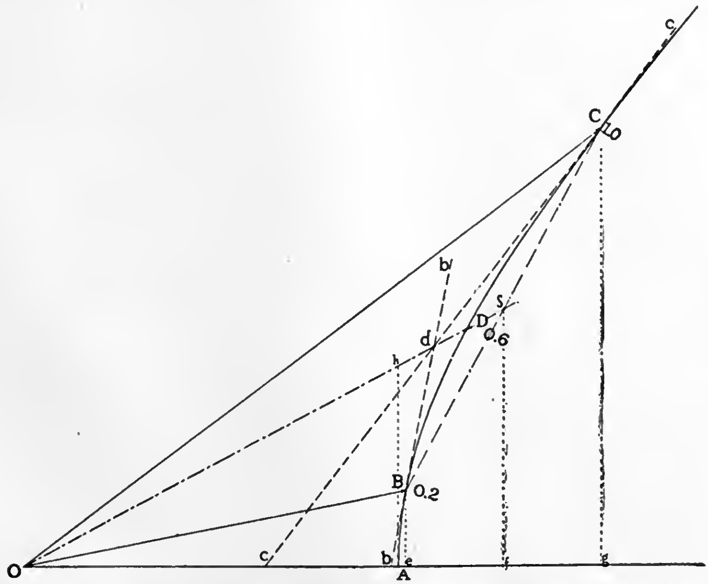

FIG. 18. — Bisection of a hyperbolic sector by a radius vector through the intersection of terminal tangents, or through the midpoint of the chord between terminal points.

(2) By drawing the chord BC, and marking the radius OD through the midpoint δ of this chord.

Similarly, if we take any hyperbolic angle BDC Fig. 18, between the points B and C of a rectangular hyperbola, we may bisect this angle in either of two ways: —

(1) By drawing tangents bb, cc, to the curve at the points B, C, respectively, and drawing the straight line Od from the center O through the point of intersection d.

(2) By drawing the chord, BC, and marking the radius OD through the midpoint δ of this chord.*

Comparative Geometry of Complex Circular and Hyperbolic Functions

We have seen that the real circular functions $\sin x$, $\cos x$, may be derived from a circle diagram, and that the real hyperbolic functions $\sinh x$, $\cosh x$, may be similarly derived from a rectangular hyperbola diagram. We shall see that both the complex circular functions $\sin\,(x + iy)$, $\cos\,(x + iy)$, and the complex hyperbolic functions $\sinh\,(x + iy)$, $\cosh\,(x + iy)$, may be derived from a combination circle and hyperbola diagram.

Complex Circular Functions

Construction for $\sin\,(x \pm iy)$, and for $\sin^{-1}(u \pm iv)$

In Fig. 19, take $OA = 1$ along the negative side of the Y axis. From OA as initial line, mark off the circular angle $x = AOB$. From OB as initial line, mark off the hyperbolic angle y and its sector BOD. Let C be the foot of the perpendicular from D on OB produced. Drop perpendiculars from C and D on the axis of reals OX, at c and d respectively. About c as center, rotate cd positively through 90° to cZ. Then will

* This proposition is proved in Greenhill's "Differential and Integral Calculus," Macmillan & Co., 1896, page 67, Fig. 16, for the particular case when the angle AOB, in our Fig. 18, is zero. The demonstration of proposition (1) for the general case of Fig. 18 is not difficult; but that found by the author is rather lengthy. The demonstration of the general proposition (2) is, however, brief and direct, as follows: —

Let θ_1 be the hyperbolic angle of the sector AOB.

Let θ_2 be the hyperbolic angle of the sector AOC.

Then it is required to show that

$$\frac{\delta f}{Of} = \frac{hA}{OA} = \frac{hA}{1} = \tanh\frac{(\theta_1 + \theta_2)}{2}.$$

But from an inspection of the Figure,

$$Be = \sinh\theta_1, \qquad Cg = \sinh\theta_2,$$
$$Oe = \cosh\theta_1, \qquad Og = \cosh\theta_2,$$

so that

$$f\delta = \frac{eB + gC}{2} = \frac{\sinh\theta_1 + \sinh\theta_2}{2}$$

and

$$Of = \frac{Oe + Og}{2} = \frac{\cosh\theta_1 + \cosh\theta_2}{2}.$$

Thus

$$\frac{f\delta}{Of} = \frac{\sinh\theta_1 + \sinh\theta_2}{\cosh\theta_1 + \cosh\theta_2}$$

which is a known equivalent expression for $\tanh\frac{(\theta_1 + \theta_2)}{2}$, see Becker and Van Orstrand's "Hyperbolic Functions," 1909, p. XIV, Formula (49).

the complex vector $OZ = Oc + icd$ be the required circular sine of the complex angle $x + iy$ radians. In the case represented, $\sin(1 + i1) = 1.299 + i\,0.635 = 1.446 \underline{/26°.05}$. As y varies, Z moves along the hyperbola bZ: —

$$\frac{X^2}{\sin^2 x} - \frac{Y^2}{\cos^2 x} = 1 \tag{14}$$

and as x varies, Z moves along the ellipse: —

$$\frac{X^2}{\cosh^2 y} + \frac{Y^2}{\sinh^2 y} = 1. \tag{15}$$

Both the hyperbola and the ellipse have as common foci FF', the points $X = \pm 1$, $Y = 0$.

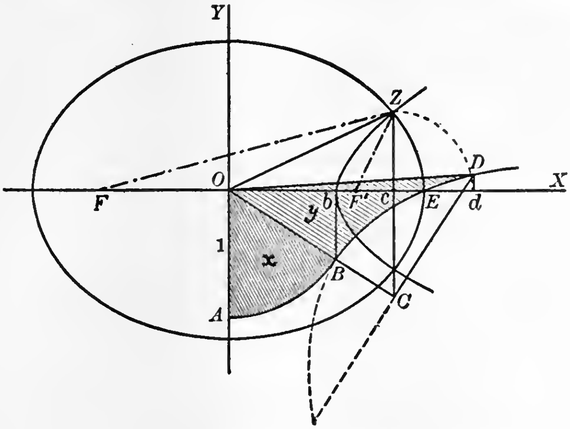

FIG. 19. — Constructions for $\sin(x + iy)$ and $\sin^{-1}(u \pm iv)$.

From the same figure, we have also, if $Oc = u$ and $cZ = iv$,

$$\sin^{-1}(u \pm iv) = \sin^{-1} Ob \pm i\cosh^{-1} OE$$

$$= \sin^{-1}\left\{\frac{\sqrt{(1 + u)^2 + v^2} - \sqrt{(1 - u)^2 + v^2}}{2}\right\}$$

$$\pm i\cosh^{-1}\left\{\frac{\sqrt{(1 + u)^2 + v^2} + \sqrt{(1 - u)^2 + v^2}}{2}\right\} \tag{16}$$

since $Ob = \dfrac{FZ - F'Z}{2}$ and $OE = \dfrac{FZ + F'Z}{2}$.

CONSTRUCTIONS FOR $\cos(x + iy)$ AND FOR $\cos^{-1}(u + iv)$

In Fig. 20, take OA as unit distance along the real or X axis, in the positive direction. From OA as initial line, describe the circular angle x, or the circular sector AOB of area $x/2$. On OB as initial line, describe the hyperbolic angle y, or the hyperbolic sector area BOD of area $y/2$. Let C be the foot of the perpendicular from D on OB produced. Drop perpendiculars from C and D on the X axis at c and d respectively. With c as center, rotate the line cd in the positive direction through 90° into the position cZ; so that $\overline{cZ} = i.\overline{cd}$. Then the complex quantity $OZ = Oc + i.cd$ will be the required circular cosine of the complex angle $(x + iy)$ radians.

In the case represented, $\cos(1 + i\,1) = 0.834 - i\,0.989 = 1.293\overline{\backslash 49^\circ.866}$. As y varies, Z moves along the hyperbola bZ defined by

$$\frac{X^2}{\cos^2 x} - \frac{Y^2}{\sin^2 x} = 1 \qquad (17)$$

and as x varies, Z moves along the ellipse ZE, defined by

$$\frac{X^2}{\cosh^2 y} + \frac{Y^2}{\sinh^2 y} = 1. \qquad (18)$$

Both the hyperbola and the ellipse have as common foci FF', the points $X = \pm 1$, $Y = 0$.

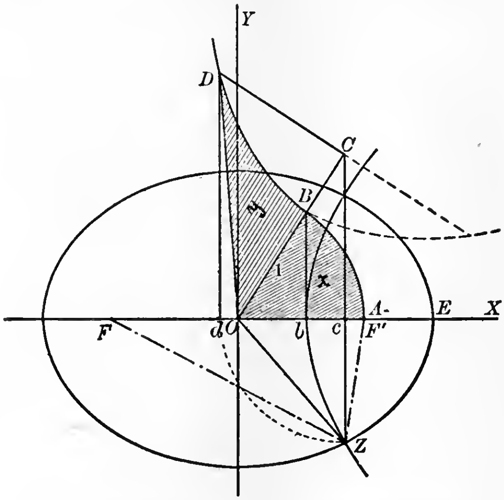

Fig. 20. — Constructions for $\cos(x \pm iy)$ and $\cos^{-1}(u \pm iv)$.

From Fig. 20 we obtain: —

$$\begin{aligned}\cos^{-1} OZ &= \cos^{-1}(u \pm iv) = \cos^{-1} Ob \mp \cosh^{-1} OE \\ &= \cos^{-1}\left\{\frac{\sqrt{(1+u)^2+v^2} - \sqrt{(1-u)^2+v^2}}{2}\right\} \\ &\quad \mp i\cosh^{-1}\left\{\frac{\sqrt{(1+u)^2+v^2} + \sqrt{(1-u)^2+v^2}}{2}\right\} \qquad (19)\end{aligned}$$

since $Ob = \frac{FZ - F'Z}{2}$ and $OE = \frac{FZ + F'Z}{2}$.

Complex Hyperbolic Functions

Constructions for $\sinh(x \pm iy)$ and $\sinh^{-1}(u \pm iv)$

In Fig. 21, take OA as unit length along the real or X axis in the positive direction. From OA as initial line, describe the circular angle y, or the circular sector AOB of area $y/2$. From OB as initial line describe the hyperbolic angle x, or the hyperbolic sector BOD of area $x/2$. Let C be the foot of the perpendicular from D on OB produced. Drop perpendiculars from C and D on the Y axis at c and d respectively. With c as center, rotate the line cd negatively, or clockwise, through 90° to cZ. The complex quantity $OZ = Oc - i.cd$ will be the required hyperbolic sine of the complex angle $(x + iy)$ radians.

In the case represented, $\sinh(1 + i\,1) = 0.635 + i\,1.2985 = 1.446\,\underline{/63°.95}$. As x varies, Z moves along the hyperbola Zbz: —

$$\frac{Y^2}{\sin^2 y} - \frac{X^2}{\cos^2 y} = 1 \tag{20}$$

and as y varies, Z moves along the ellipse $XExy$

$$\frac{Y^2}{\cosh^2 x} + \frac{X^2}{\sinh^2 x} = 1. \tag{21}$$

The hyperbola and ellipse are confocal at the points F and f defined by $X = 0$, $Y = \pm 1$.

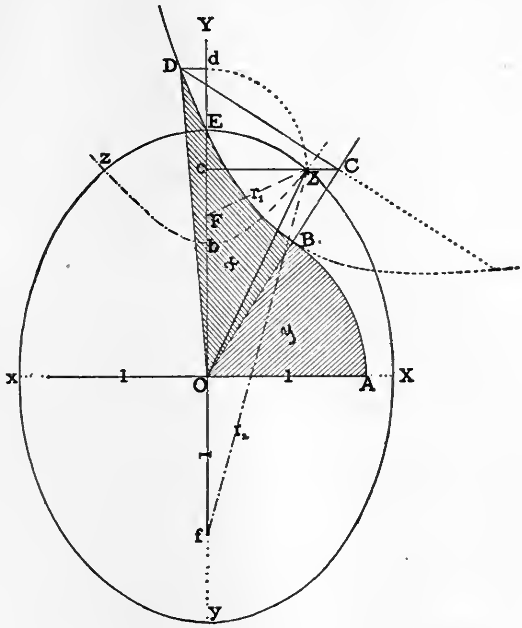

FIG. 21. — Constructions for sinh $(x \pm iy)$ and $\sinh^{-1}(u \pm iv)$.

From Fig. 21 we also obtain

$$\sinh^{-1}(u \pm iv) = \sinh^{-1}(cZ \pm Oc) = \cosh^{-1} OE \pm i \sin^{-1} Ob.$$

$$= \cosh^{-1}\left\{\frac{\sqrt{(1+v)^2 + u^2} + \sqrt{(1-v)^2 + u^2}}{2}\right\}$$

$$\pm i \sin^{-1}\left\{\frac{\sqrt{(1+v)^2 + u^2} - \sqrt{(1-v)^2 + u^2}}{2}\right\} \tag{22}$$

since $OE = \dfrac{fZ + FZ}{2}$ and $Ob = \dfrac{fZ - FZ}{2}$.

CONSTRUCTIONS FOR cosh $(x + iy)$ AND $\cosh^{-1} (u + iv)$

In Fig. 22, take OA as unit distance along the real or X axis in the positive direction. From OA, as initial line, describe the circular angle y, or the circular sector AOB of area $y/2$. From OB, as initial line, describe the hyperbolic angle x, or the hyperbolic sector BOD of area $x/2$. Let C be the foot of the perpendicular from D on OB produced. Drop perpendiculars from C and D on the X axis at c and d respectively. About c, as

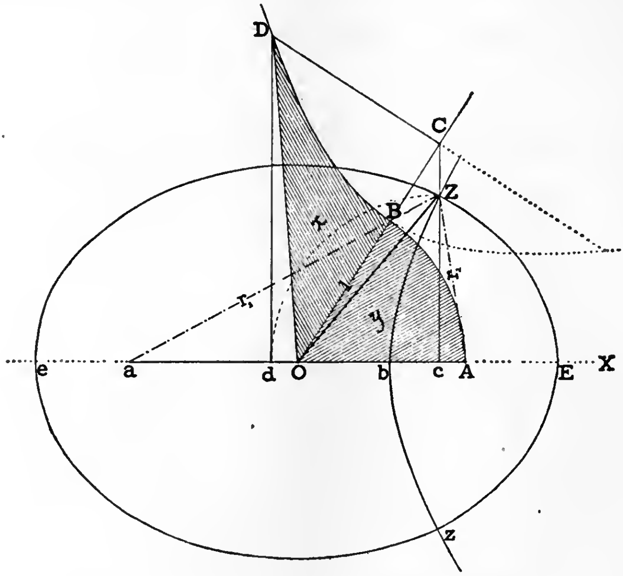

FIG. 22. — Constructions for cosh $(x \pm iy)$ and $\cosh^{-1} (u \pm iv)$.

center, rotate the line cd negatively, or clockwise, through 90° to cZ; so that $cZ = -i.cd$. Then the complex quantity $OZ = Oc - i.cd$ will be the required cosine of the complex angle $(x + iy)$ radians.

In the case represented, $\cosh (1 + i\,1) = 0.834 + i\,0.989 = 1.293\underline{/49°.866}$. As x varies, Z moves along the hyperbola Zbz

$$\frac{X^2}{\cos^2 y} - \frac{Y^2}{\sin^2 y} = 1. \tag{23}$$

As y varies, Z moves along the ellipse $EZez$

$$\frac{X^2}{\cosh^2 x} + \frac{Y^2}{\sinh^2 x} = 1. \tag{24}$$

The ellipse and hyperbola are confocal at the points A, a, defined by $X = \pm 1$, $Y = O$.

From the same figure. If $Oc = u$ and $cZ = iv$

$$\cosh^{-1}(u \pm iv) = \cosh^{-1}(Oc \pm i.cZ) = \cosh^{-1} OE \pm i \cos^{-1} Ob$$

$$= \cosh^{-1}\left(\frac{r_1 + r_2}{2}\right) \pm i \cos^{-1}\left(\frac{r_1 - r_2}{2}\right)$$

$$= \cosh^{-1}\left\{\frac{\sqrt{(1+u)^2 + v^2} + \sqrt{(1-u)^2 + v^2}}{2}\right\}$$

$$\pm i \cos^{-1}\left\{\frac{\sqrt{(1+u)^2 + v^2} - (\sqrt{1-u)^2 + v^2}}{2}\right\}. \quad (25)$$

Constructions for $\tan(x \pm iy)$ and $\tan^{-1}(u \pm iv)$

In Fig. 23, lay off along the X axis a point A distant $\tan x$ from O, and also a point B such that $OB = \cot x$. Draw a circle through A and B having its center on OX at C. The distance OC measures $\cot 2x$ and the radius of the circle is $\operatorname{cosec} 2x$. Any circle thus drawn will intersect the Y axis at two points e and f which are at unit distances from O. Then lay off the Y axis two points a and b, distant respectively $\tanh y$ and $\coth y$ from O. With center c on the Y axis, draw a circle through a and b. The distance Oc will be $\coth 2y$, and the radius of the circle will be $\operatorname{cosech} 2y$. Let Z be the point of intersection of the two circles. Then OZ is the required tangent of $(x + iy)$. If x is kept constant but y is varied, the point Z moves over the circle AZB. If on the other hand y is kept constant, but x is varied, Z will move around the circle aZb and will make one complete revolution for each increase of π units in x.

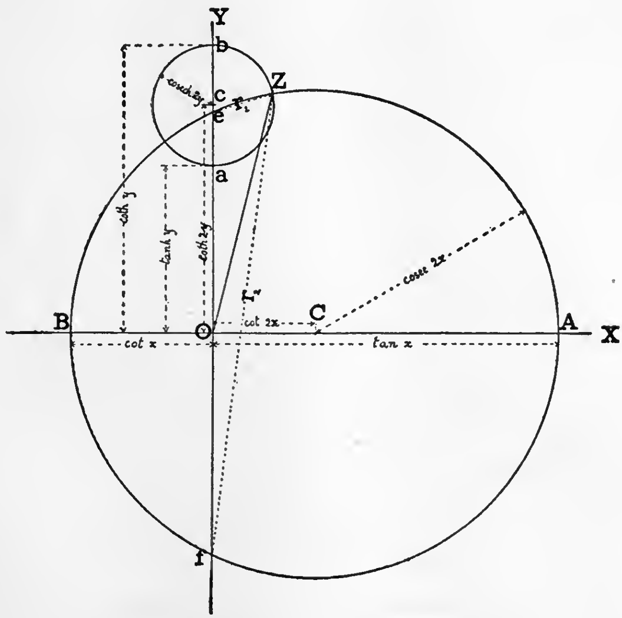

FIG. 23. — Constructions for tan $(x \pm iy)$ and $\tan^{-1}(u \pm iv)$.

In the case represented, $\tan(1 + i\,1) = 0.2718 + i\,1.084 = 1.118\underline{/75^\circ.916}$.

From Fig. 23 it is evident that the angle AeO is equal to x, and angle eAO is thus the complement of x. Hence half the angle between r_1 and r_2 is the complement of x. Moreover $y = \log_e \sqrt{r_2/r_1}$. Therefore, if $OZ = u + iv$,

$$\tan^{-1}(u \pm iv) = \left\{\frac{\pi - \tan^{-1}\left(\frac{u}{\pm v - 1}\right) + \tan^{-1}\left(\frac{u}{\pm v + 1}\right)}{2}\right\} + \frac{i}{2}\log_e \sqrt{\frac{(1 \pm v)^2 + u^2}{(1 \mp v)^2 + u^2}}. \qquad (26)$$

Constructions for $\tanh(x \pm iy)$ and $\tanh^{-1}(u \pm iv)$

In Fig. 24 mark off on the axis of reals xOX two points T and X such that the former is distant by $\tanh x$ and the latter by $\coth x$ from the origin O. Find the point C midway between T and X. Incidentally, this point will be distant $\coth 2x$ from O. With

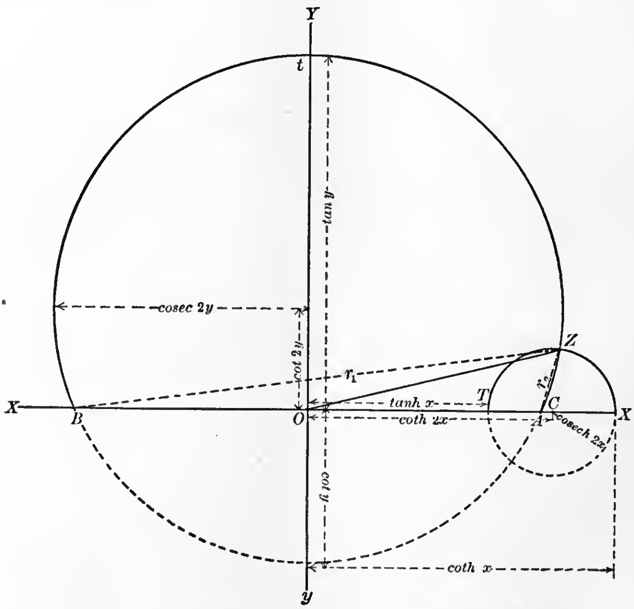

FIG. 24. — Constructions for $\tanh(x \pm iy)$ and $\tanh^{-1}(u \pm iv)$

center C and radius $CT = CX = \operatorname{cosech} 2x$, draw the circle TXZ. Mark off on the axis of imaginaries yOY, two points t and y such that the former is distant by $\tan y$ and the latter by $\cot y$ from the origin O. Find the point c midway between them. Incidentally, this point will be distant $\cot 2y$ from O. With center c and radius $ct = cy = \operatorname{cosec} 2y$, draw the circle $ByAt$. This circle will cut the axis of reals at two points A and B distant each one unit from O. It will also intersect the circle TXZ perpendicularly at Z. Connect OZ. This vector OZ is the required hyperbolic tangent of the complex angle $(x + iy)$ radians.

In the case represented, $\tanh(1 + i\,1) = 1.084 + i\,0.2718 = 1.118\underline{/14^\circ.084}$. As x varies, Z moves along the circle AtB. As y varies, Z moves along the circle TZX, performing one complete revolution for each π units of increase in y.

From the same Figure, if $OZ = u \pm iv = op \pm ipZ$, we have $\tanh^{-1}(u \pm iv) = x \pm iy$.

In this case $x = \log_e \sqrt{r_1/r_2}$

$$\text{or } x = \tfrac{1}{2}\log_e(r_1/r_2). \tag{27}$$

and $y = \dfrac{\pi - \alpha}{2}$ where α is the circular angle at Z between the radii vectores r_1 and r_2. Also

$$\alpha = \tan^{-1}\left(\frac{u+1}{\pm v}\right) - \tan^{-1}\left(\frac{u-1}{\pm v}\right). \tag{28}$$

Hence

$$\tanh^{-1}(u \pm iv) = \tfrac{1}{2}\log_e\sqrt{\frac{(1+u)^2+v^2}{(1-u)^2+v^2}} + i\left\{\frac{\pi - \tan^{-1}\left(\dfrac{u+1}{\pm v}\right) + \tan^{-1}\left(\dfrac{u-1}{\pm v}\right)}{2}\right\} \tag{29}$$

DEGREE OF PRECISION OF TABLES

Introduction

If a numerical quantity, freed from decimals, is correctly expressed to within say 1 part in 1000; *i.e.*, 1 part in 10^3, then this degree of precision may conveniently be described as precision of the third order. In general, therefore, if a numerical quantity be correctly expressed to within 1 part in 10^n, where n is any real positive number, its precision is of the nth order. The weekly statement of the financial assets of a bank might be expressed as \$186,257,361.26 which, assuming that it is to be taken as being numerically correct to a single cent, represents 18,625,736,126 cents, an apparent precision of 1 in $10^{10.27}$, or of the 10.27th order. Physical and astronomical precisions are less ostensibly pretentious, however, and rarely exceed the 6th order. Engineering computations are commonly satisfied with a precision of the third order; although, on rare occasions, the order required may be the highest that physics can attain.

The degree of precision corresponding to retaining a specified number of significant digits correct within unity, in Tables, can only be stated approximately; since it varies with the values of the digits. Thus, if we have tables containing entries each of three significant digits, correct to the last digit, the lowest entry may be 100 and the highest 999. The precision would therefore be 1 in 100 in the former case, and practically 1 in 1000 in the latter. That is the order of precision would vary between the second and the third. The average precision might be stated as of the 2.5th order. Such tables of n significant digits lay claim to an average precision of the $(n - 1/2)$th order.

Many tables are, however, employed in which the last digit is stated to be correct to the nearest digit; that is within half of unity. On that understanding, the precision of say a three-digit table would vary between 1/2 in 100 to 1/2 in 999 or between the 2.3rd and the 3.3rd order, with a mean of the 2.8th order. Consequently, we may say that such tables, giving n significant digits, lay claim to an average precision of the $(n - 0.2)$th order.

Degree of Precision Presented in the Following Tables

The tables of complex hyperbolic functions here presented have been prepared with a view to giving five decimal places regularly. This means five significant digits when the values of the results lie between 0.1 and unity, six significant digits when they lie between 1 and 10, four when they lie between 0.1 and 0.01 and so on. Tables I to VI inclusive were computed with the aid of five-figure logarithms of real hyperbolic functions, so that their degree of precision is necessarily limited to, and must on the average fall below that of such logarithm tables, which, as we have seen, is of the 4.8th

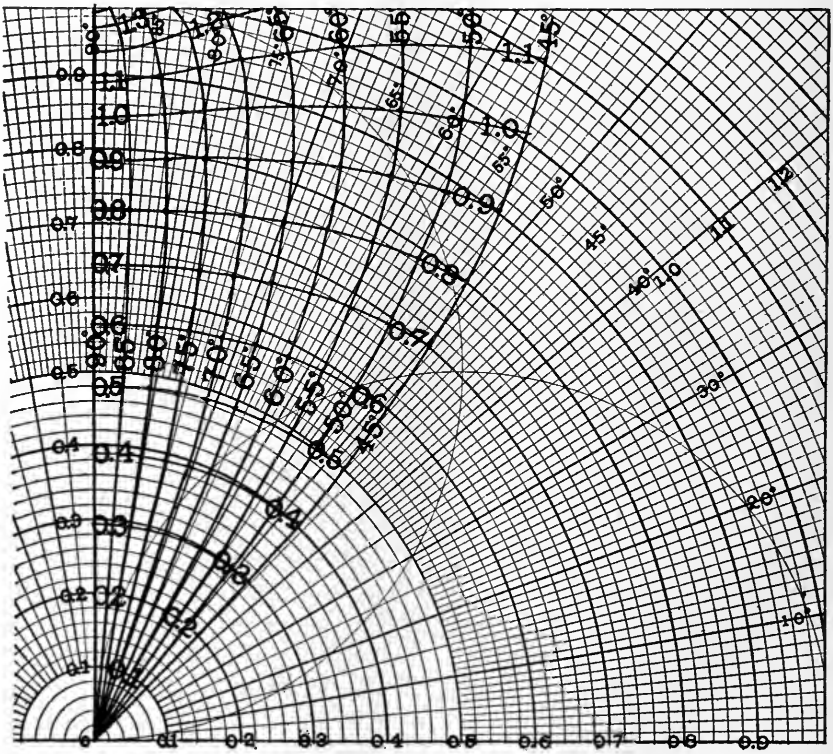

Fig. 25. — sinh ($\rho \underline{/\delta}$) expressed in polar coördinates.

order. Exclusive of such mistakes as may exist, they do not claim a degree of precision beyond the 4.5th order.

Tables VII to XIII inclusive were, however, computed for the most part from Ligowski's gudermannian angles which are tabulated by him for each thousandth of a hyperbolic radian, to the nearest hundredth of a second of circular arc. The logarithms of the corresponding real hyperbolic functions were then found in the eight-place tables of Bauschinger and Peters, which offer such logarithms for each and every second of circular arc. The results were computed in the formulas to at least six significant digits and the sixth was then frequently discarded to meet the needs of the five-decimal table. Consequently in this group of tables, excluding such errors as may exist, the precision is on the average of the 4.8th order, and rises to the 5.8th order, when the value of the result lies between 1 and 10. The average precision of the second group of tables is thus about half an order greater than that of the first group.

Precision of the Charts in the Atlas

The charts of the accompanying Atlas have been prepared with a view to offering three digits in the deduced quantity, if reasonable care be taken in their use. This represents an average degree of precision of the 2.5th order; or about equal to that fur-

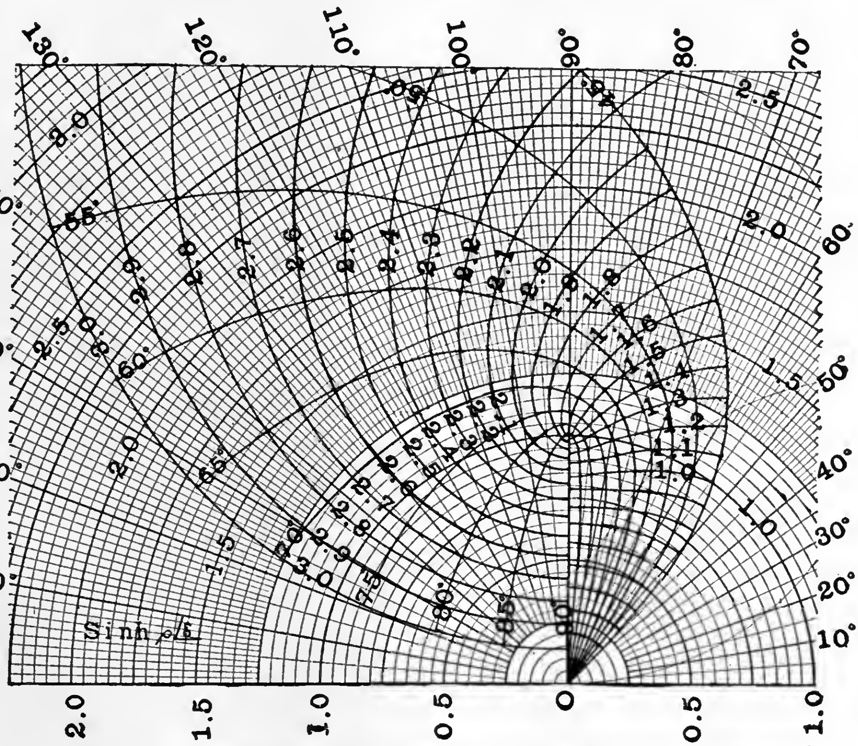

Fig. 26. — sinh ($\rho \underline{/\delta}$) expressed in polar coördinates.

nished by an ordinary 25 cm. slide rule. When a higher degree of precision than this is needed, arithmetical interpolation in the Tables must ordinarily be resorted to; but even then it is desirable to obtain a preliminary approximate value from the Atlas, in order to furnish a check against gross error.

Graphic Representations

Figs. 25 and 26 present the results obtained from Table I to true polar coördinates. Each intersection of the curves corresponds to an entry in the table. Fig. 25 relates to pages 2, 3, and Fig. 26 to the rest of the table. The curves of constant ρ intersect those of constant δ perpendicularly. That is, each intersection occurs theoretically at right angles. If, however, an attempt is made to prepare plates corresponding to Figs. 25 and 26 on a large scale, for a reasonable degree of precision, in rapid interpolation by graphical inspection, difficulties present themselves. Firstly, it has been found impracticable to procure polar coördinate ruled sheets large enough. Secondly, regular polar coördinate charts of the type presented in Figs. 25 and 26 necessarily offer very little graphical interpolation precision at small radial distances from the origin of coördinates, where the radial lines, sharply converging, crowd the diagram. On the other hand, they offer relatively great apparent interpolation precision at large distances from the origin, as the radii diverge. In preparing interpolation charts, therefore, the author has devised the scheme of using squared paper sheets for presenting such polar coördinate quantities as appear in Figs. 25 and 26. Fig. 27 represents the regular polar coördinate r/γ diagram, in which the lines of constant r are circles concentric at O, and the lines of constant γ are radii diverging from O. Fig. 28 represents the corresponding squared polar coördinate diagram, in which the lines of constant r are the vertical straight lines 1-1, 2-2, 3-3, and 4-4. The lines of constant γ are the parallel horizontal lines, while the origin point O in Fig. 27 becomes expanded into the original straight line o-o in Fig. 28. The straight, broken line DU is transformed into the curved line du, and, in general, orthogonally intersecting curves of one diagram do not transform into orthogonally intersecting curves on the other.

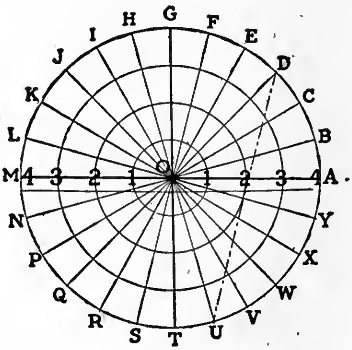

Fig. 27. — Polar Coördinate Diagram Regular Presentation on Circular Sheet.

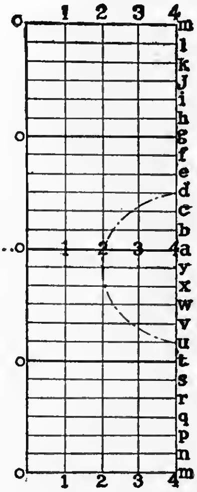

Fig. 28. — Polar Coördinate Diagram Squared Presentation on Rectangular Sheet.

Interpolation Charts

Plates IA, IB, and IC of the Atlas correspond to Table I and present, to squared polar coördinates, the results in that table. Each intersection of curves in the plates corresponds to one entry in the table. Plate IA includes the entries on pages 2 and 3 of the table; while Plates IB and IC include the entries in the remainder of the table. The curves of constant ρ and constant δ intersect one another at various angles, but the method of interpolation requires little explanation. The entering quantity will fall within some particular curvilinear parallelogram. The respective opposite sides may be subdivided into tenths in any of the three following ways: (1) by direct inspectional estimate, (2) by graphical subdivision on a sheet of tracing paper laid over the chart, (3) by means of a radiating decimal scale of lines, prepared in advance, on tracing paper or thin celluloid. It is not, in general, worth the effort of attempting a closer subdivision than tenths of the sides of any parallelogram. The point of intersection of lines parallel to the sides, through the correct decimal points, is then to be marked on the covering tracing paper, or held with a blunt pointer, such as a knitting needle, on the chart itself, and the rectangular coördinates of this point read off from the parallel ruling or background of the plate. That is, the charts are always used with the entering variable on the curvilinear coördinates, and with the result found on the rectilinear framework in the background; except when inverse functions are sought, and the procedure consequently reversed.

TABLE I

$$\sinh (\rho \underline{/\delta}) = r \underline{/\gamma}$$

Polar Hyperbolic Sines of a Polar Variable

Table I, pages 2 to 7, gives the hyperbolic sine of vectors up to 3.0 in modulus, by steps of 0.1, for each degree of argument from 45° to 90°. The results are also expressed in polar coördinates, as plane vectors, corresponding to the relation:—

$$\sinh (\rho \underline{/\delta}) = r \underline{/\gamma} \tag{30}$$

or

$$\rho \underline{/\delta} = \sinh^{-1} (r \underline{/\gamma}). \tag{31}$$

The graphs of the results to true polar coördinates appear in Figs. 25 and 26, where the curves of constant ρ always intersect orthogonally the curves of constant δ; so that at any point of intersection the angles of intersection are right angles. In Plates IA, IB, and IC of the Atlas, the same graphs are given to squared polar coördinates, the disadvantages of the distortion being more than outweighed by the advantages in facility of graphic interpolation. In these charts the curves of constant ρ do not intersect the curves of constant δ orthogonally.

Interpolation. First Case. In Modulus only

If Table I is entered with a vector quantity of more than one decimal in modulus and of some exact degree of argument, such as $2.76\,\underline{/70^\circ}$; then the result will lie nearly on the line between the results for $2.7\,\underline{/70^\circ}$ and $2.8\,\underline{/70^\circ}$; namely, between $1.2031\,\underline{/136.489}$ and $1.2136\,\underline{/143^\circ.005}$. A first approximation may be obtained by proportional parts between them, thus: —

$$\begin{aligned}
&\text{Required sinh } 2.76\,\underline{/70^\circ} & & \\
&\text{by Table, sinh } 2.80\,\underline{/70^\circ} &=\ & 1.2136\,\underline{/143^\circ.005}. \\
&\text{by Table, sinh } 2.70\,\underline{/70^\circ} &=\ & 1.2031\,\underline{/136^\circ.489}. \\
\hline
&\text{Difference } 0.10\,\underline{/70^\circ} &=\ & 0.0105\quad \underline{/6^\circ.516}. \\
&\text{Proportion for } 0.06\,\underline{/70^\circ} &=\ & 0.0063\quad \underline{/3^\circ.910}. \\
&\text{sinh } 2.70\,\underline{/70^\circ} &=\ & 1.2031\,\underline{/136^\circ.489}. \\
\hline
&\text{Result sinh } 2.76\,\underline{/70^\circ} &=\ & 1.2094\,\underline{/140^\circ.399}. \\
&\text{The true value is} & & \mathbf{1.2086\,\underline{/140^\circ.366}.}
\end{aligned}$$

Interpolation by the Use of Taylor's Theorem

When more precise interpolation is required than that by simple intermediate proportion, we may use Taylor's theorem in the following form; since

$$\frac{d\,(\sinh\theta)}{d\theta} = \cosh\theta, \quad \frac{d^2\,(\sinh\theta)}{d\theta^2} = \sinh\theta, \quad \text{etc.}$$

$$\sinh(\theta+\Delta\theta) = \sinh\theta + \Delta\theta\cosh\theta + \frac{(\Delta\theta)^2}{2!}\sinh\theta + \frac{(\Delta\theta)^3}{3!}\cosh\theta + \ldots \quad (32)$$

Let $\theta = \rho\,\underline{/\delta}$ and $\Delta\theta = \Delta\rho\,\underline{/\delta}$.

Then

$$\sinh\{(\rho+\Delta\rho)\,\underline{/\delta}\} = \sinh(\rho\,\underline{/\delta}) + \Delta\rho\,\underline{/\delta}.\ \cosh(\rho\,\underline{/\delta}) + \frac{(\Delta\rho)^2}{2!}\,\underline{/2\delta}.\ \sinh(\rho\,\underline{/\delta}) + \ldots \quad (33)$$

The number of correction terms to be retained depends on the interval, and on the degree of precision desired. It is seldom that more than two correction terms have to be retained. Thus in the case already considered: —

$$\sinh(2.76\,\underline{/70^\circ}) = \sinh(2.7\,\underline{/70^\circ}) + 0.06\,\underline{/70^\circ}.\cosh(2.7\,\underline{/70^\circ}) + 0.0018\,\underline{/140^\circ}.\sinh(2.7\,\underline{/70^\circ}).$$

By Table II, page 13, $\cosh(2.7\,\underline{/70^\circ}) = 1.3422\,\underline{/153^\circ.322}$. Consequently dealing first with the first correction term only:

$$\begin{aligned}
\sinh(2.76\,\underline{/70^\circ}) &= 1.2031\,\underline{/136^\circ.489} + 0.06\,\underline{/70^\circ} \times 1.3422\,\underline{/153^\circ.322} \\
&= 1.2031\,\underline{/136^\circ.489} + 0.08053\,\underline{/223^\circ.322} \\
&= 1.2031\,\underline{/136^\circ.489}\,(1 + 0.066937\,\underline{/86^\circ.833}) \\
&= 1.2031\,\underline{/136^\circ.489}\,(1 + 0.003698 + i\,0.06684) \\
&= 1\ 2031\,\underline{/136^\circ.489}\,(1.00592\,\underline{/3^\circ.810}) \\
&= 1.2102\,\underline{/140^\circ.299}.
\end{aligned}$$

Taking next the second correction term into account.

$$
\begin{aligned}
\sinh(2.76\,\underline{/70^\circ}) &= 1.2102\,\underline{/140^\circ.299} + 0.0018\,\underline{/140^\circ} \times 1.2031\,\underline{/136^\circ.489}\\
&= 1.2102\,\underline{/140^\circ.299} + 0.002166\,\underline{/276^\circ.489}\\
&= 1.2102\,\underline{/140^\circ.299}\cdot(1 + 0.001789\,\underline{/136^\circ.190})\\
&= 1.2102\,\underline{/140^\circ.299}\,(1 - 0.00129 + i\,0.00124)\\
&= 1.2102\,\underline{/140^\circ.299}\,(0.99871 + i\,0.00124)\\
&= 1.2102\,\underline{/140^\circ.299}\,(0.99871\,\underline{/0^\circ.067})\\
&= \mathbf{1.2086}\,\underline{/\mathbf{140^\circ.366}}. \qquad (34)
\end{aligned}
$$

The correct result is $\mathbf{1.2086}\,\underline{/\mathbf{140^\circ.366}}$.

Second and General Case. Interpolation both in Modulus and Argument

Let the entered quantity be $\sinh(1.025\,\underline{/80.75^\circ})$.

We have from Table I the four nearest results as follows: —

$$
\begin{aligned}
\sinh 1.0\,\underline{/80^\circ} &= 0.85125\,\underline{/83^\circ.489}. & \sinh 1.1\,\underline{/80^\circ} &= 0.90416\,\underline{/84^\circ.286}.\\
\sinh 1.0\,\underline{/81^\circ} &= 0.84940\,\underline{/84^\circ.156}. & \sinh 1.1\,\underline{/81^\circ} &= 0.90172\,\underline{/84^\circ.877}.
\end{aligned}
$$

$$
\begin{aligned}
\text{Difference for } 1^\circ &= -\,0.00185 + 0^\circ.667. & \text{Diff. for } 1^\circ &= -\,0.00244 + 0^\circ.591.\\
\text{Proportion for } 0.75^\circ &= -\,0.001388 + 0.500. & & -\,0.00183 + 0.443.\\
\sinh 1.0\,\underline{/80^\circ.75} &= 0.84986\,\underline{/83^\circ.989}. & \sinh 1.1\,\underline{/80^\circ.75} &= 0.90233\,\underline{/84^\circ.729}.\\
\sinh 1.1\,\underline{/80.75} &= 0.90233\,\underline{/84^\circ.729}.\\
\text{Difference for } 0.1 &= +\,0.05247\,\underline{/0^\circ.740}.\\
\text{Proportion for } 0.025 &= +\,0.01312\,\underline{/0^\circ.185}.\\
\sinh 1.025\,\underline{/80^\circ.75} &= \mathbf{0.86298}\,\underline{/\mathbf{84^\circ.174}}.\\
\text{The true value} &= \mathbf{0.86372}\,\underline{/\mathbf{84^\circ.166}}. \qquad (35)
\end{aligned}
$$

Dual Interpolation by the Use of Taylor's Theorem

Let the nearest tabular function be $\sinh\theta = \sinh(\rho\,\underline{/\delta})$ and the required function $\sinh(\theta + \Delta\theta) = \sinh\{(\rho + \Delta\rho)\,\underline{/\delta + \Delta\delta}\}$.

Then $(\rho + \Delta\rho)\,\underline{/\delta + \Delta\delta} = \rho\,\underline{/\delta} + (\Delta\rho + i\,\rho\Delta\delta)$. (36)

where the increment $\Delta\rho + i\,\rho\Delta\delta$ is taken with reference to the vector axis $\rho\,\underline{/\delta}$. Referring this increment to the initial axis of reference,

$$\theta + \Delta\theta = (\rho + \Delta\rho)\,\underline{/\delta + \Delta\delta} = \rho\,\underline{/\delta} + \sqrt{\Delta\rho^2 + (\rho\Delta\delta)^2}\,\underline{/\delta + \tan^{-1}\left(\frac{\rho\Delta\delta}{\Delta\rho}\right)}. \qquad (37)$$

$$\text{So that } \Delta\theta = \sqrt{(\Delta\rho)^2 + (\rho\Delta\delta)^2}\,\underline{/\delta + \tan^{-1}(\rho\Delta\delta/\Delta\rho)}. \qquad (38)$$

When, however, $\Delta\delta$ is not very small, the last formula may contain an appreciable error, and the following method of deducing $\Delta\theta$, using rectangular complex quantities, is to be preferred.

$$\text{Let} \quad \theta = \rho\,\underline{/\delta} = x + iy.$$

$$\text{and} \quad \theta + \Delta\theta = (\rho + \Delta\rho)\,\underline{/\delta + \Delta\delta} = x + \Delta x + i\,(y + \Delta y). \tag{39}$$

$$\text{Then } \Delta\theta = \Delta x + i\,\Delta y \tag{40}$$

$$= \sqrt{(\Delta x)^2 + (\Delta y)^2}\,\underline{/\tan^{-1}(\Delta y/\Delta x)}. \tag{41}$$

We then have by Taylor's theorem, as before,

$$\sinh(\theta + \Delta\theta) = \sinh\theta + \Delta\theta.\cosh\theta + \frac{(\Delta\theta)^2}{2}.\sinh\theta + \frac{(\Delta\theta)^3}{3.2}.\cosh\theta + \ldots \tag{42}$$

a series in which two correcting terms only need ordinarily be retained. Thus, in the example last considered, $\theta = 1.0\,\underline{/80^\circ}$ and $\theta + \Delta\theta = 1.025\,\underline{/80^\circ.75}$. If we form $\Delta\theta$ by the use of (37), we have $\Delta\rho = 0.025$, $\Delta\delta = 0^\circ.75 = 0.01309$ radian, $\rho\Delta\delta = 0.01309$.

$$\begin{aligned}\Delta\theta &= \sqrt{(0.025)^2 + (0.01309)^2}\,\underline{/80^\circ + \tan^{-1}(0.01309/0.025)}\\ &= 0.02822\,\underline{/80^\circ + 27^\circ.637}\\ &= \mathbf{0.02822\,\underline{/107^\circ.637}}.\end{aligned}$$

If we form $\Delta\theta$ by the use of the rigid formula (41)

$$\begin{aligned}\theta + \Delta\theta &= 1.025\,\underline{/80^\circ.75} = 0.164761 + i\,1.0116715.\\ \theta &= 1.0\,\underline{/80^\circ} \quad = \underline{0.173648 + i\,0.9848078}.\\ \Delta\theta &= -\,0.008887 + i\,0.0268637\\ &= \mathbf{0.028295\,\underline{/108^\circ.306}}.\end{aligned}$$

Entering now the correction formula (42), we find in the tables:

$$\sinh 1.0\,\underline{/80^\circ} = 0.85125\,\underline{/83^\circ.489}, \qquad \cosh 1.0\,\underline{/80^\circ} = 0.57991\,\underline{/14^\circ.521}.$$

so that

$$\begin{aligned}\sinh 1.025\,\underline{/80^\circ.75} = \sinh 1.0\,\underline{/80^\circ} &+ 0.028295\ \underline{/108^\circ.306} \times \cosh 1.0\,\underline{/80^\circ}\\ &+ \frac{(0.028295)^2}{2}\,\underline{/216^\circ.612} \times \sinh 1.0\,\underline{/80^\circ}\\ &+ \frac{(0.028295)^3}{6}\,\underline{/324^\circ.918} \times \cosh 1.0\,\underline{/80^\circ}\end{aligned}$$

$$\begin{aligned}= 0.85125\,\underline{/83^\circ.489} &+ 0.028295\ \underline{/108^\circ.306} \times 0.57991\,\underline{/14^\circ.521}\\ &+ 0.0004003\,\underline{/216^\circ.612} \times 0.85125\,\underline{/83^\circ.489}\\ &+ 0.000\,001\ \underline{/324^\circ.918} \times 0.57991\,\underline{/14^\circ.521}.\end{aligned}$$

It is evident that in conformity with the precision of the tables, only the first two correction terms need be included. Taking the first into account, we have:

$$\begin{aligned}\sinh 1.025\,\underline{/80^\circ.75} &= 0.85125\,\underline{/83^\circ.489} + 0.028295\,\underline{/108^\circ.306} \times 0.57991\,\underline{/14^\circ.521}\\ &= 0.85125\,\underline{/83^\circ.489} + 0.016408\,\underline{/122^\circ.827}\\ &= 0.85125\,\underline{/83^\circ.489}\,(1 + 0.019276\,\underline{/39^\circ.338})\\ &= 0.85125\,\underline{/83^\circ.489}\,(1 + 0.014909 + i\,0.012219)\\ &= 0.85125\,\underline{/83^\circ.489}\,(1.014909 + i\,0.012219)\\ &= 0.85125\,\underline{/83^\circ.489} \times 1.01498\,\underline{/0^\circ.690}\\ &= 0.86400\,\underline{/84^\circ.179}.\end{aligned}$$

Taking up the second correction term: —

$$\sinh 1.025\underline{/80^\circ.75} = 0.86400\underline{/84^\circ.179} + 0.0004003\underline{/216^\circ.612} \times 0.85125\underline{/83^\circ.489}$$
$$= 0.86400\underline{/84^\circ.179} + 0.0003405\underline{/300^\circ.101}$$
$$= 0.86400\underline{/84^\circ.179}\,(1 + 0.000395\underline{/215^\circ.922})$$
$$= 0.86400\underline{/84^\circ.179}\,(1 - 0.00032 - i\,0.000232)$$
$$= 0.86400\underline{/84^\circ.179}\,(0.99968 - i\,0.000232)$$
$$= 0.86400\underline{/84^\circ.179} \times 0.99968\overline{\backslash 0^\circ.013}$$
$$= \mathbf{0.863727\underline{/84^\circ.166}}.$$

The true value is $\mathbf{0.86372\ \underline{/84^\circ.166}}$.

Conclusions

In general, dual interpolation by simple proportion, as in (35), will give a result of the third order of precision. In order to secure precision of the fourth order, interpolation by the use of Taylor's theorem as in (42) may be required.

Extension of Table by Use of Formula for 2θ

Although Table I is only carried as far as 3.0 in modulus ($\rho = 3$); yet it may be used with a little additional calculation in conjunction with Table II, for obtaining the hyp. sines of plane vector quantities of moduli up to 6.0, by means of the formula:

$$\sinh 2\theta = 2 \sinh \theta \cosh \theta \qquad (43)$$

Example: Required $\sinh 5.0\underline{/77^\circ}$, a quantity outside of Table I. Here $\theta = 2.5\underline{/77^\circ}$ is within the limits of the Table; so that

$$\sinh 5.0\underline{/77^\circ} = 2 \times \sinh 2.5\underline{/77^\circ} \times \cosh 2.5\underline{/77^\circ} \qquad (44)$$
$$= 2 \times 0.87843\underline{/120^\circ.891} \times 0.96459\underline{/156^\circ.524}$$
$$= 2 \times 0.87843 \times 0.96459\underline{/277^\circ.415}$$
$$= 1.75686 \times 0.96459\underline{/277^\circ.415}$$
$$= \mathbf{1.69465\underline{/277^\circ.415}}.$$

This method ordinarily calls for interpolation both in $\sinh\theta$ and $\cosh\theta$. For this reason, it may be preferable to obtain the required result by the use of either Table VII or Table X, the limits of which are less restricted.

TABLE II

$$\cosh(\rho\underline{/\delta}) = r\underline{/\gamma}$$

Polar Hyperbolic Cosines of a Polar Variable

Table II gives the value of $\cosh \rho\underline{/\delta}$ between the limits of $\rho = 0$ and $\rho = 3.0$ by steps of 0.1, and the limits $\delta = 45^\circ$ and $\delta = 90^\circ$, by steps of 1°. The graphs of these quantities, to squared polar coördinates, appear in Plates IIA and IIB of the Atlas.

Interpolation by Simple Proportion

In general, as in the case of Table I, a very fair degree of precision in interpolation can be obtained by taking first simple proportional parts in argument, and then simple proportional parts in modulus.

Example: Required $\cosh (0.93105 \underline{/57^\circ.518})$.

We have from Table II: —

$$\begin{array}{lcl}
\cosh 0.9 \underline{/57^\circ} & = & 0.88922 \underline{/23^\circ.140}. \\
\cosh 0.9 \underline{/58^\circ} & = & 0.87602 \underline{/23^\circ.003}. \\
\hline
\text{Difference for } 1^\circ & = & -\,0.01320 \ \underline{/0^\circ.137}. \\
\text{Diff. for } 0.518^\circ & = & -\,0.00685 \ \underline{/0^\circ.071}. \\
\hline
\cosh 0.9 \underline{/57^\circ.518} & = & 0.88237 \underline{/23^\circ.069}. \\
\hline
\end{array}$$

$$\begin{array}{lcl}
\cosh 1.0 \underline{/57^\circ} & = & 0.87976 \underline{/28^\circ.917}. \\
\cosh 1.0 \underline{/58^\circ} & = & 0.86350 \underline{/28^\circ.823}. \\
\hline
\text{Difference for } 1^\circ & = & -\,0.01626 \ \underline{/0^\circ.094}. \\
\text{Diff. for } 0.518^\circ & = & -\,0.00844 \ \underline{/0^\circ.049}. \\
\hline
\cosh 1.0 \underline{/57^\circ.518} & = & 0.87132 \underline{/28^\circ.868}. \\
\cosh 0.9 \ \underline{/57.518} & = & 0.88237 \ \underline{/23.069}. \\
\hline
\text{Difference for } 0.1 & = & -\,0.01105 \ \underline{/5^\circ.799}. \\
\text{Diff. for } 0.3105 & = & -\,0.00343 \ \underline{/1^\circ.800}. \\
\cosh 0.93105 \underline{/57^\circ.518} & = & \mathbf{0.87894} \ \underline{/\mathbf{24^\circ.869}}. \\
\text{The correct value is} & & \mathbf{0.87837} \ \underline{/\mathbf{24.803}}.
\end{array}$$

Interpolation of Taylor's Theorem

When a higher degree of precision is required than can be expected from simple proportional parts, we may use Taylor's Theorem in the following form: —

$$\cosh (\theta + \Delta\theta) = \cosh \theta + \Delta\theta \sinh \theta + \frac{(\Delta\theta)^2}{2!} \cosh \theta + \frac{(\Delta\theta)^3}{3!} \sinh \theta + \ldots \quad (45)$$

Example: Required $\cosh 0.93105 \underline{/57^\circ.518}$

having given in Table II $\cosh 0.9 \underline{/57^\circ} = 0.88922 \underline{/23^\circ.140}$

and in Table I $\sinh 0.9 \underline{/57^\circ} = 0.85414 \underline{/64^\circ.218}$.

$$\begin{array}{rcl}
0.93105 \underline{/57.518} & = & 0.500 \quad + i\, 0.785398. \\
0.900 \quad \underline{/57^\circ} & = & \underline{0.49018 + i\, 0.754804.} \\
\Delta\theta & = & 0.00982 + i\, 0.030594 \\
 & = & 0.03214 \underline{/72^\circ.196}.
\end{array}$$

$$\begin{aligned}
\cosh 0.93105 \underline{/57^\circ.518} = {} & \cosh 0.9 \underline{/57^\circ} + 0.03214 \underline{/72^\circ.196} \times 0.85414 \underline{/64^\circ.218} \\
& + 0.00052 \underline{/144^\circ.392} \times 0.88922 \underline{/23^\circ.140}.
\end{aligned}$$

It is evident that for the Tables here considered only two correction terms need be included. Taking up the first correction term,

$$
\begin{aligned}
\cosh 0.93105\underline{/57^\circ.518} &= 0.88922\underline{/23^\circ.140} + 0.03214\underline{/72^\circ.196} \times 0.85414\underline{/64^\circ.218} \\
&= 0.88922\underline{/23^\circ.140} + 0.02745\underline{/136^\circ.414} \\
&= 0.88922\underline{/23^\circ.140}\,(1 + 0.03087\underline{/113^\circ.274}) \\
&= 0.88922\underline{/23^\circ.140}\,(1 - 0.01220 + i\,0.02835) \\
&= 0.88922\underline{/23^\circ.140}\,(0.98780 + i\,0.02835) \\
&= 0.88922\underline{/23^\circ.140} \times 0.98780\,(1 + i\,0.02870) \\
&= 0.88922\underline{/23^\circ.140} \times 0.98780 \times 1.00041\underline{/1^\circ.645} \\
&= 0.87873\underline{/24^\circ.785}.
\end{aligned}
$$

Taking up the second correction term: —

$$
\begin{aligned}
\cosh 0.93105\underline{/57^\circ.518} &= 0.87873\underline{/24^\circ.785} + 0.00052\underline{/144^\circ.392} \times 0.88922\underline{/23^\circ.140} \\
&= 0.87873\underline{/24^\circ.785} + 0.00046\underline{/167^\circ.532} \\
&= 0.87873\underline{/24^\circ.785}\,(1 + 0.000524\underline{/142^\circ.747} \\
&= 0.87873\underline{/24^\circ.785}\,(1 - 0.000416 + i\,0.000317) \\
&= 0.87873\underline{/24^\circ.785}\,(0.999584 + i\,0.000317) \\
&= 0.87873 \times 0.999584\underline{/24^\circ.785}\,(1 + i\,0.00032) \\
&= 0.87837\underline{/24^\circ.785^\circ} \times 1\underline{/0.018^\circ} \\
&= \mathbf{0.87837\underline{/24^\circ.803}}.
\end{aligned}
$$

The correct value is **$0.87837\underline{/24^\circ.803}$.**

Graphical Interpolation

For rapid but less precise work, interpolation may be made by proportional parts on Plate IIA or Plate IIB, without arithmetical computation.

TABLE III

$$\tanh(\rho\underline{/\delta}) = r\underline{/\gamma}$$

Polar Hyperbolic Tangents of a Polar Variable

Table III gives in polar coördinates the value of tanh $\rho\underline{/\delta}$ between the limits $\rho = 0$ and $\rho = 3.0$ by steps of 0.1, and the limits $\delta = 45^\circ$ and $\delta = 90^\circ$, by steps of 1°. The graphs of these quantities, to squared polar coördinates, appear in Plates IIIA and IIIB of the Atlas.

Interpolation by Simple Proportion

In general, as in the cases of Tables I and II, a very fair degree of precision can be obtained by taking first simple proportional parts in argument and then simple proportional parts in modulus.

Example: Required tanh $(0.93105\underline{/57^\circ.518})$.

We have from Table III: —

$$\tanh 0.9\,\angle 57^\circ = 0.96056\,\angle 41^\circ.078.$$
$$\tanh 0.9\,\angle 58^\circ = 0.97069\,\angle 42^\circ.111.$$
$$\text{Difference for } 1^\circ = 0.01013\,\angle 1^\circ.033.$$
$$\text{Diff. for } 0.518^\circ = 0.00525\,\angle 0^\circ.535.$$
$$\tanh 0.9\,\angle 57^\circ.518 = 0.96581\,\angle 41^\circ.613.$$

$$\tanh 1.0\,\angle 57^\circ = 1.06648\,\angle 37^\circ.035.$$
$$\tanh 1.0\,\angle 58^\circ = 1.08054\,\angle 38^\circ.004.$$
$$\text{Difference for } 1^\circ = 0.01406\,\angle 0^\circ.969.$$
$$\text{Diff. for } 0.518^\circ = 0.00728\,\angle 0^\circ.502.$$
$$\tanh 1.0\,\angle 57^\circ.518 = 1.07376\,\angle 37^\circ.537.$$
$$\tanh 0.9\,\angle 57.518 = 0.96581\,\angle 41^\circ.613.$$
$$\text{Difference for } 0.1 = 0.10795\,\angle -4^\circ.076.$$
$$\text{" for } 0.3105 = 0.03352\,\angle -1^\circ.266.$$

$$\text{Inferred value of } \tanh 0.93105\,\angle 57^\circ.518 = \mathbf{0.99933\,\angle 40^\circ.347.}$$
$$\text{Correct value of } \tanh 0.93105\,\angle 57^\circ.518 = \mathbf{1.0000\,\angle 40^\circ.395.}$$

Interpolation by Taylor's Theorem

For a higher degree of interpolation precision than by simple proportion, we may use Taylor's theorem in the following form: —

$$\tanh(\theta + \Delta\theta) = \tanh\theta + \Delta\theta\,\operatorname{sech}^2\theta - \frac{(\Delta\theta)^2}{2!}.\ 2\operatorname{sech}^2\theta\tanh\theta$$
$$-\frac{(\Delta\theta)^3}{3!}\,2\operatorname{sech}^2\theta\,(\operatorname{sech}^2\theta - 2\tanh^2\theta) + \ldots \qquad (46)$$

Example: Required $\tanh 0.93105\,\angle 57^\circ.518$.

having given in Table I $\sinh 0.9\,\angle 57^\circ = 0.85414\,\angle 64.218$.

II $\cosh 0.9\,\angle 57^\circ = 0.88922\,\angle 23^\circ.140$.

III $\tanh 0.9\,\angle 57^\circ = 0.96056\,\angle 41^\circ.078$.

Here $\Delta\theta = 0.03214\,\angle 72^\circ.196$, as given by (41). Hence by Taylor's theorem as far as the second correction term inclusive,

$$\tanh 0.93105\,\angle 57^\circ.518 = \tanh 0.9\,\angle 57^\circ + \frac{0.03214\,\angle 72.196}{(0.88922)^2\,\angle 46.280}$$
$$-\frac{(0.03214)^2\,\angle 144^\circ.392}{(0.88922)^2\,\angle 46^\circ.280} \times 0.96056\,\angle 41^\circ.078.$$

Taking up the first correction term: —

$$\begin{aligned}\tanh 0.93105\,\angle 57^\circ.518 &= 0.96056\,\angle 41^\circ.078 + \frac{0.03214}{0.79071}\,\angle 25^\circ.916\\ &= 0.96056\,\angle 41^\circ.078 + 0.04065\,\angle 25^\circ.916\\ &= 0.96056\,\angle 41^\circ.078\,(1 + 0.04232\,\angle -15^\circ.162)\\ &= 0.96056\,\angle 41^\circ.078\,(1 + 0.04084 - i\,0.01107)\\ &= 0.96056\,\angle 41^\circ.078\,(1.04084 - i\,0.01107)\\ &= 0.96056\,\angle 41.078\,(1.04090\,\angle -0^\circ.609)\\ &= 0.99985\,\angle 40^\circ.469.\end{aligned}$$

Taking up next the second correction term: —

$$\tanh 0.93105\,\underline{/57^\circ.518} = 0.99985\,\underline{/40^\circ.469} - \frac{0.00103\,\underline{/144^\circ.392} \times 0.96056\,\underline{/41^\circ.078}}{(0.88922)^2\,\underline{/46^\circ.280}}$$

$$= 0.99985\,\underline{/40^\circ.469} + \frac{0.00103 \times 0.96056}{0.79071}\overline{\backslash 40^\circ.810}$$

$$= 0.99985\,\underline{/40^\circ.469} + 0.00126\overline{\backslash 40^\circ.810}$$

$$= 0.99985\,\underline{/40^\circ.469}\,(1 + 0.00126\overline{\backslash 81.279})$$

$$= 0.99985\,\underline{/40^\circ.469}\,(1 + 0.00019 - i\,0.00125)$$

$$= 0.99985\,\underline{/40^\circ.469}\,(1.00019 - i\,0.00125)$$

$$= 0.99985\,\underline{/40^\circ.469} \times 1.00019\overline{\backslash 0^\circ.072}$$

$$= 1.0000\ \underline{/40^\circ.397}.$$

$$\text{Correct value} = \mathbf{1.0000\ \underline{/40^\circ.395}.}$$

When more than two correction terms have to be retained, it is often easier to determine sinh $(\theta + \Delta\theta)$ and cosh $(\theta + \Delta\theta)$ by Taylor's theorem, as already described, and then to take their ratio for tanh $(\theta + \Delta\theta)$.

TABLE IV

Polar Ratio $\frac{\sinh \theta}{\theta}$ for Polar Values of θ

Table IV has been prepared by dividing the values of sinh θ found successively in Table I by their respective values of θ. The object of the table is to facilitate the computation of the equivalent T or Π of any uniform alternating-current line of known electrical constants.* That is, the table pertains more particularly to the applications of hyperbolic functions than to the fundamental properties of those functions. The table gives the vector value of $\frac{\sinh (\rho\,\underline{/\delta})}{\rho\,\underline{/\delta}}$ for the range $\rho = 0$ to $\rho = 3$ by steps of 0.1, and for $\delta = 45^\circ$ to $\delta = 90^\circ$ by steps of 1°. The graphs of the values contained in the tables are plotted to squared polar coördinates in Charts IVA and IVB of the Atlas, for rapid graphic interpolation.

Interpolation by Simple Proportion

A fair degree of precision in interpolation can ordinarily be obtained by first taking simple proportional parts in argument and then simple proportional parts in modulus.

Example: Required $\frac{\sinh (1.025\,\underline{/80^\circ.75})}{1.025\,\underline{/80^\circ.75}}$.

* "The Application of Hyperbolic Functions to Electrical Engineering Problems," by A. E. Kennelly, University of London Press, 1914, Chap. III.

We have from Table IV the following values of $\dfrac{\sinh\theta}{\theta}$: —

For $1.0\,\underline{/80^\circ}$ =	0.85125	$\underline{/3^\circ.489}$.
$1.0\,\underline{/81^\circ}$ =	0.84940	$\underline{/3^\circ.156}$.
Difference for 1° =	− 0.00185	$\underline{/-0^\circ.333}$.
0.75° =	− 0.00139	$\underline{/-0^\circ.250}$.
For $1.0\,\underline{/80^\circ.75}$ =	0.84986	$\underline{/3^\circ.239}$.

For $1.1\,\underline{/80^\circ}$ =	0.82196	$\underline{/4^\circ.286}$.
$1.1\,\underline{/81^\circ}$ =	0.81975	$\underline{/3^\circ.877}$.
Difference for 1° =	− 0.00221	$\underline{/-0^\circ.409}$.
0°.75 =	− 0.00166	$\underline{/-0^\circ.307}$.
For $1.1\,\underline{/80^\circ.75}$ =	0.82030	$\underline{/3^\circ.979}$.
For $1.0\,\underline{/80^\circ.75}$ =	0.84986	$\underline{/3^\circ.239}$.
Difference for 0.1 =	− 0.02956	$\underline{/0^\circ.740}$.
" for 0.025 =	− 0.00739	$\underline{/0^\circ.185}$.
For $1.025\,\underline{/80^\circ.75}$ =	0.84247	$\underline{/3^\circ.424}$.
Correct value =	**0.84265**	**$\underline{/3.^\circ 416}$.**

When a higher degree of precision is required than can be expected from proportional parts, the proper value of sinh $(\theta + \Delta\theta)$ should be obtained by Taylor's theorem as already explained in connection with Table I, and this value divided by $(\theta + \Delta\theta)$; because the expansion of $\dfrac{\sinh(\theta + \Delta\theta)}{(\theta + \Delta\theta)}$ directly, by Taylor's theorem, does not lend itself conveniently for computation.

Extension for the Range of the Table by the Use of Formula for 2θ

Although Table IV is only carried as far as 3.0 in modulus ($\rho = 3$); yet it may be used with a little additional calculation, in conjunction with Table II, for obtaining $\dfrac{\sinh\theta}{\theta}$, for vector values of θ with moduli up to 6.0, by means of the formula: —

$$\sinh 2\theta = 2 \sinh\theta . \cosh\theta \qquad (47)$$

whence

$$\frac{\sinh 2\theta}{2\theta} = \frac{\sinh\theta}{\theta} . \cosh\theta . \qquad (48)$$

Consequently, to find $\dfrac{\sinh\theta}{\theta}$ for the double of any quantity within the range of Table IV, find the value of $\dfrac{\sinh\theta}{\theta}$ for the quantity, by interpolation directly in Table IV, and multiply the result by the hyperbolic cosine of the quantity as obtained from Table II. Corresponding steps may be taken with Charts II and IV.

Example: Required $\dfrac{\sinh(5.0\,\underline{/77^\circ})}{5.0\,\underline{/77^\circ}}$, this being outside of the limits of Table IV; but not outside twice the value therein obtainable.

Here $\dfrac{\sinh\theta}{\theta}$ for $\theta = 2.5\,\underline{/77^\circ}$ is by Table IV 0.35137 $\underline{/43^\circ.891}$.

and cosh θ " " " " " " " II 0.96459 $\underline{/156^\circ.524}$.

$$\text{Hence } \frac{\sinh (5.0 \underline{/77^\circ})}{5.0 \underline{/77^\circ}} = 0.35137 \underline{/43^\circ.891} \times 0.96459 \underline{/156^\circ.524}.$$

$$= \mathbf{0.33893 \underline{/200^\circ.415}}.$$

This procedure calls for interpolation both in $\frac{\sin \theta}{\theta}$ and in $\cosh \theta$. For this reason it may be preferable to obtain the required result by the use of either Table VII or Table X, the limits of which are less restricted.

TABLE V

Polar Ratio $\frac{\tanh \theta}{\theta}$ for Polar Values of θ

Table V, like Table IV, has been prepared for electrical engineering applications of hyperbolic functions, rather than for developing these functions alone. It gives the vector value of $\frac{\tanh (\rho \underline{/\delta})}{\rho \underline{/\delta}}$ for the range $\rho = 0$ to $\rho = 3.0$ in modulus, by steps of 0.1, and for the range $\delta = 45^\circ$ to $\delta = 90^\circ$ in argument, by steps of 1°. It was computed directly from Table III by dividing the resulting values successively by their respective values of θ. The graphs of the values in Table V are presented to squared polar coördinates in Chart V, for rapid graphic interpolation.

Interpolation by Simple Proportion

Except where a high degree of precision in interpolation is required, it is preferable to interpolate first by simple proportion in argument, and then by simple proportion in modulus; although this order of operations may be inverted.

Example: Required $\frac{\tanh \theta}{\theta}$ for $\theta = 0.93105 \underline{/57^\circ.518}$.

We have from Table V: —

$$\text{For } \theta = 0.9 \underline{/57^\circ} = 1.06729\ \overline{\backslash 15^\circ.922}.$$
$$\theta = 0.9 \underline{/58^\circ} = 1.07854\ \overline{\backslash 15^\circ.889}.$$

$$\text{Difference for } 1^\circ = 0.01125\ \overline{\backslash - 0.033}.$$
$$\text{" for } 0.518^\circ = 0.00583\ \overline{\backslash - 0.017}.$$

$$\text{For } \theta = 0.9 \underline{/57^\circ.518} = 1.07312\ \overline{\backslash 15^\circ.905}.$$

$$\text{For } \theta = 1.0 \underline{/57^\circ} = 1.06648\ \overline{\backslash 19^\circ.965}.$$
$$\theta = 1.0 \underline{/58^\circ} = 1.08054\ \overline{\backslash 19^\circ.996}.$$

$$\text{Difference for } 1^\circ = 0.01406\ \overline{\backslash 0^\circ.031}.$$
$$\text{" for } 0^\circ.518 = 0.00728\ \overline{\backslash 0^\circ.016}.$$

$$\text{For } \theta = 1.0 \underline{/57^\circ.518} = 1.07376\ \overline{\backslash 19^\circ.981}.$$
$$\theta = 0.9 \underline{/57^\circ.518} = 1.07312\ \overline{\backslash 15.905}.$$

$$\text{Difference for } 0.1 = 0.00064\ \overline{\backslash 4^\circ.076}.$$
$$\text{" for } 0.03105 = 0.00020\ \overline{\backslash 1^\circ.266}.$$

$$\text{For } \theta = 0.93105 \underline{/57^\circ.518} = 1.07332\ \overline{\backslash 17^\circ.171}.$$

$$\text{Correct value, } \mathbf{1.07406\ \overline{\backslash 17^\circ.123}}.$$

When a higher degree of precision is needed than simple proportion can give, it is preferable to find the proper interpolated value for $\tanh\theta$ from preceding tables and then to divide by θ; since the function $\frac{\tanh(\theta+\Delta\theta)}{(\theta+\Delta\theta)}$ does not lend itself to expansion by Taylor's theorem in a simple form.

Tables IV and V jointly, with their respective graphs in the Atlas, enable the equivalent T or Π of any uniform alternating-current line in the steady state, at a single frequency, to be completely determined, provided θ does not exceed six radians in modulus (δ lying between 45° and 90°); because although in both tables, θ is not carried beyond three radians; yet $\frac{\sinh\theta}{\theta}$ can be found by extension up to six radians, and in the formulas for deducing the equivalent T or Π, $\frac{\tanh\theta}{\theta}$ has only to be carried to half the modulus of $\frac{\sinh\theta}{\theta}$.

The following example may illustrate the use of Tables IV and V either with or without the aid of the graphic interpolation Charts IV and V of the Atlas. An alternating-current line of uniform electrical constants is 250 km. long and has, at a certain frequency, a total conductor impedance of $565.711\ \underline{/84^\circ.777}$ ohms, associated with a total distributed insulation admittance of $4.3707\times10^{-3}\underline{/90^\circ}$ mhos. Its hyperbolic angle is therefore $\sqrt{5.65711\times4.3707\times10^{-1}\ \underline{/174^\circ.777}} = 1.5724\ \underline{/87^\circ.388}$ hyperbolic radians. Interpolating either from the tables or the Charts IV and V, we obtain

$$\frac{\sinh\theta}{\theta} = 0.638\ \underline{/2^\circ.6} \quad\text{and}\quad \frac{\tanh\left(\frac{\theta}{2}\right)}{\left(\frac{\theta}{2}\right)} = \frac{\tanh 0.7862\ \underline{/87^\circ.388}}{0.7862\ \underline{/87^\circ.388}} = 1.27\ \overline{\backslash 1^\circ.5}.$$

If we multiply the conductor impedance by $\frac{\sinh\theta}{\theta}$, we have

$565.711\ \underline{/84^\circ.777}\times0.638\ \underline{/2^\circ.6} = 360.69\ \underline{/87^\circ.377}$ ohms, and if we multiply half the insulation admittance by $\frac{\tanh\left(\frac{\theta}{2}\right)}{\left(\frac{\theta}{2}\right)}$, we have

$$2.1854\times10^{-3}\underline{/90^\circ}\times1.27\ \overline{\backslash 1^\circ.5} = 2.78\times10^{-3}\underline{/88^\circ.5}\text{ mhos} = 359.77\ \overline{\backslash 88^\circ.5}\text{ ohms}.$$

If now we apply an artificial condenser leak of $2.78\times10^{-3}\underline{/88^\circ.5}$ mhos to each end of a localised impedance coil of $360.69\ \underline{/87^\circ.377}$ ohms, we obtain the "equivalent Π" of the line at the frequency considered, and such a combination of localised impedance and admittances would behave exactly like the line, at its terminals, or outside them, so as to be capable of replacing the line in any electrical system, at that frequency.

TABLE VI

Polar Functions of Polar Semi-Imaginary Quantities

A semi-imaginary quantity is a complex numerical quantity which, when expressed in rectangular coördinates, has equal real and imaginary components; or, when expressed in polar coördinates, has an argument of 45°. That is $x \underline{/\pm 45^\circ} = a \pm i\,a$. The interest of the table pertains primarily to the application of hyperbolic functions to uniform alternating-current lines of negligibly small linear inductance and leakance, a case approximated to by cabled lines at low frequencies. The table was first published by the author in the transactions of the International Electrical Congress of St. Louis (1904). The arguments of the results are given in degrees and minutes, and not in degrees and decimals like the rest of the tables.

The table gives the hyperbolic sine, cosine, tangent, cosecant, secant, and cotangent of the vector $x \underline{/45^\circ}$ for the range $x = 0$ to $x = 20.5$, by steps in x of 0.1 up to $x = 6$, and of 0.05 beyond that point. At $x = 6$, the values of the hyp. sine and cosine so nearly coincide, that they are taken as equal in the table, thus bringing sech x and cosech x into equality as well as $\tanh x = \coth x = 1$. Graphs of the functions are given in Chart VI as far as $x = 4$, approximately.

Interpolation by Simple Proportion

In general, interpolation may be quickly effected by simple proportional parts of modulus since the argument is constant at 45°. This procedure is sufficiently evident to require no exemplification.

Interpolation of Taylor's Theorem

When precise interpolation is necessary, we have the following expansions for f $(\theta + \Delta\theta)$

$$\sinh\left\{(x + \Delta x)\underline{/45^\circ}\right\} = \sinh(x\underline{/45^\circ}) + (\Delta x)\underline{/45^\circ}.\ \cosh(x\underline{/45^\circ}) + \frac{(\Delta x)^2}{2!}\underline{/90^\circ}.\ \sinh(x\underline{/45^\circ}) + \frac{(\Delta x)^3}{3!}\underline{/135^\circ}.\ \cosh(x\underline{/45^\circ}) + \ldots\ldots \quad (49)$$

$$\cosh\left\{(x + \Delta x)\underline{/45^\circ}\right\} = \cosh\ (x\underline{/45^\circ} + (\Delta x)\underline{/45^\circ}.\ \sinh(x\underline{/45^\circ}) + \frac{(\Delta x)^2}{2!}\underline{/90^\circ}.\ \cosh(x\underline{/45^\circ}) + \frac{(\Delta x)^3}{3!}\underline{/135^\circ}.\ \sinh(x\underline{/45^\circ}) + \ldots\ldots \quad (50)$$

$$\tanh\left\{(x + \Delta x)\underline{/45^\circ}\right\} = \tanh\ (x\underline{/45^\circ} + (\Delta x)\underline{/45^\circ}.\ \text{sech}^2(x\underline{/45^\circ}) - \frac{(\Delta x)^2}{2!}\underline{/90^\circ}.\ 2\,\text{sech}^2(x\underline{/45^\circ}).\ \tanh(x\underline{/45^\circ}) - \frac{(\Delta x)^3}{3!}\underline{/135^\circ}.\ 2.\ \text{sech}^2(x\underline{/45^\circ}).\ \left\{\text{sech}^2(x\underline{/45^\circ}) - 2\tanh^2(x\underline{/45^\circ})\right\} + \ldots\ldots \quad (51)$$

Example: Required $\cosh(3.1\underline{/45^\circ})$, having given in Table VI

$$\sinh(3.0\underline{/45^\circ}) = 4.1986\underline{/120^\circ.48'}.$$
$$\cosh(3.0\underline{/45^\circ}) = 4.1443\underline{/122^\circ.16'}.$$

Here $\cosh(3.1\,\underline{/45^\circ}) = 4.1443\,\underline{/122^\circ.16'} + 0.1\,\underline{/45^\circ} \times 4.1986\,\underline{/120^\circ.48'}$

$$+ \frac{0.01\,\underline{/90^\circ}}{2} \times 4.1443\,\underline{/122^\circ.16'} + \frac{0.001}{6}\,\underline{/135^\circ} \times 4.1986\,\underline{/120^\circ.48'}$$

$$= 4.1443\,\underline{/122^\circ.16'} + 4.1986\,\underline{/120^\circ.48}\,(0.1\,\underline{/45^\circ} + 0.00017\,\underline{/135^\circ})$$

$$+ 4.1443\,\underline{/122^\circ.16'}\,(0.005\,\underline{/90^\circ})$$

$$= 4.1443\,\underline{/122^\circ.16'}\,(1 + i\,0.005) + 4.1986\,\underline{/165^\circ.48'}\,(0.1 + i\,0.00017)$$

$$= 4.1443\,\underline{/122^\circ.16'}\,(1.0000\,\underline{/0^\circ.17'}) + 4.1986\,\underline{/165^\circ.48'}\,(0.1\,\underline{/0^\circ.01'})$$

$$= 4.1443\,\underline{/122^\circ.33'} + 0.4199\,\underline{/165^\circ.49'}$$

$$= 4.1443\,\underline{/122^\circ.33'}\,(1 + 0.10132\,\underline{/43^\circ.16'})$$

$$= 4.1443\,\underline{/122^\circ.33'}\,(1 + 0.07378 + i\,0.06944)$$

$$= 4.1443\,\underline{/122^\circ.33'}\,(1.07378 + i\,0.06944)$$

$$= 4.1443\,\underline{/122^\circ.33'} \times 1.0760\,\underline{/3^\circ.42'}$$

$$= 4.4590\,\underline{/126^\circ.15'}.$$

which is in substantial agreement with the tabulated value of cosh 3.1.

Beyond $x = 6$, the value of either $\sinh(x\,\underline{/45^\circ})$ or $\cosh(x\,\underline{/45^\circ})$ was computed from the formula: —

$$\sinh(x\,\underline{/45^\circ}) = \cosh(x\,\underline{/45^\circ}) = \frac{\epsilon^{\frac{x}{\sqrt{2}}}}{2}\,\underline{\left|\frac{x}{\sqrt{2}}\right.}\text{ radians.} \qquad (52)$$

where $\epsilon = 2.71828 \ldots$

Thus, with $x = 7$, $\frac{x}{\sqrt{2}} = 4.9498$, $\frac{\epsilon^{\frac{x}{\sqrt{2}}}}{2} = \frac{141.14}{2} = 70.57$ at the argument of 4.9498 circular radians $= 283^\circ.36'$; so that: —

$$\sinh(7\,\underline{/45^\circ}) = \cosh(7\,\underline{/45^\circ}) = 70.57\,\underline{/283^\circ.36'}$$

which coincides with the tabulated value in Table VI.

TABLE VII

$\sinh(x + iy) = u + iv$

Rectangular Hyperbolic Sines of a Rectangular Variable

Tables I to VI contain certain restrictions in range which limit their general application. They are primarily designed to cover particular applications of hyperbolic functions to electrical engineering. Tables VII to XIV, however, are free from such restrictions, and are intended to furnish the circular as well as the hyperbolic sine, cosine, and tangent of a complex angle, and to furnish this result either in the rectangular or polar form. That is, they furnish: —

$\left.\begin{array}{r}\sinh(x+iy)\\ \text{or } \sin(x+iy)\end{array}\right\}$ in the form $u + iv$; also in the form $r\,\underline{/\gamma}$

$\left.\begin{array}{r}\cosh(x+iy)\\ \text{or } \cos(x+iy)\end{array}\right\}$ in the form $u + iv$; also in the form $r\,\underline{/\gamma}$

$\left.\begin{array}{r}\tanh(x+iy)\\ \text{or } \tan(x+iy)\end{array}\right\}$ in the form $u + iv$; also in the form $r\,\underline{/\gamma}$

between the limits, for the hyperbolic functions, $x = 0$ and $x = \pm 10$, by steps of 0.05 and between the limits $y = 0$ and $y = \pm \infty$, by steps of $0.07854 = \pi/40$.

Periodic Properties of the Rectangular Complex Hyperbolic Sines and Cosines

It is well known that $\sinh \{x + i(y + 2n\pi)\} = \sinh \{x + iy\}$ (53)

and $\cosh \{x + i(y + 2n\pi)\} = \cosh \{x + iy\}$ (54)

where n is any integer.

This means that, keeping x constant, the values of the hyp. sine and hyp. cosine repeat themselves as iy passes through increments of $i.2\pi$; or they are periodic functions of iy, having the period $2\pi i$.

The matter may be visualised more clearly from geometrical reasoning. Considering the exponential form of the hyperbolic cosine,

$$\cosh(x + iy) = \frac{\epsilon^{x+iy} + \epsilon^{-(x+iy)}}{2}. \qquad (55)$$

This may written in the form: $\frac{\epsilon^{x}}{2}.\epsilon^{iy} + \frac{\epsilon^{-x}}{2}\epsilon^{-iy}$. If x be kept constant, we require to study the changes produced in this form of the hyp. cosine by varying y.

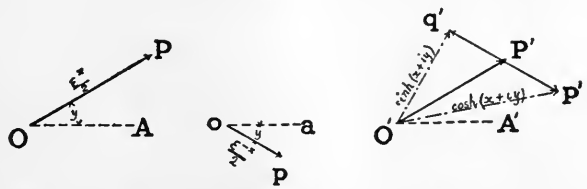

Fig. 29. — Geometrical constructions for cosh $(x + iy)$ and sinh $(x + iy)$.

In Fig. 29, OA is an initial line and OP a radius vector of length or modulus $\epsilon^{x}/2$, multiplied by ϵ^{iy}; that is rotated positively about O, from OA through a circular angle of y radians. Similarly, op is a vector of length or modulus $\epsilon^{-x}/2$ rotated negatively through a circular angle of y radians from the initial line Oa. The equation (55) states that the hyperbolic cosine is the plane vector sum of OP and op, or $O'p'$ in the Figure. If now we steadily increase the value of y, leaving x constant, we cause OP to rotate steadily counterclockwise, and also op to rotate steadily clockwise, through Δy circular radians. When $\Delta y = 2\pi$, both OP and op will have made one complete revolution and will have returned to their initial positions indicated. Consequently, the value of $\cosh \{x + i(y + 2\pi)\}$ repeats that of $\cosh \{x + iy\}$.

Since
$$\sinh(x + iy) = \frac{\epsilon^{x+iy} - \epsilon^{-(x+iy)}}{2} \qquad (56)$$

the same reasoning applies; but the vector op is added in the negative or reversed direction; so that $O'q'$ is the hyperbolic sine of $x + iy$.

The above mentioned periodic property of the hyp. sine and cosine has been utilized for shortening the tables of those functions by reducing the circular angle y of Fig. 29

from radians to quadrants. That is, any complex angle $x + iy$ represented by a point P, and radius vector OP, in the complex plane XY, Fig. 30, is first transferred to a new complex plane XQ, Fig. 31, at the point $p = x, q$, by keeping x the same in both planes, but making the points $\frac{\pi}{2}, \frac{2\pi}{2}, \frac{3\pi}{2}, \frac{4\pi}{2}, \ldots$ etc., on the Y axis of the XY diagram, become the points 1, 2, 3, 4 . . . etc., on the Q axis of the XQ diagram. Thus if

$$x + iy = 2.5 + i\,6.2832,$$
$$x + iq = 2.5 + i\,\underline{4.00}$$

where 4.00 is underscored to indicate quadrant measure, instead of the ordinary radian measure.

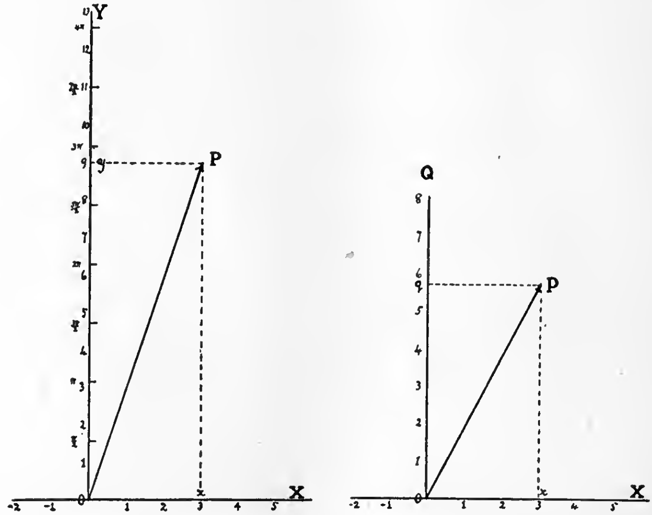

FIG. 30. FIG 31.
Transference of a Complex Quantity from the XY to the XQ Plane.

In the case indicated by Fig. 30, $x + iy = 3 + i\,9$ and $x + iq = 3 + i\,\underline{5.74}$ in Fig. 31.

Consequently, after a complex angle has been transferred from the complex plane XY to the complex plane XQ, the values of either sinh $(x + iq)$ or cosh $(x + iq)$ exactly repeat themselves for each 4 units of increase in q; or with reference to Fig. 31 for each 4 quadrants of increase in the circular angle instead of 6.2832 . . . radians. The operation of transferring the complex angle from the XY to the XQ plane may therefore be described as quadranting y; *i.e.*, changing the expression of y from circular radian units to circular quadrant units.

All of the Tables VII to XIII inclusive require to be entered in terms of $x + iq$; so that the complex entering value has to be quadranted by dividing its imaginary or y-component by the numeric $\pi/2 = 1.57079\ldots.$ This preliminary step occupies a certain extra time and effort; but it actually economises the total time and effort involved. If the tables were computed for $x + iy$, they would have to be repeated in bulk for each π radians, or 2 quadrants, increase in y. In electrical engineering applications, y frequently rises to 100 radians, and might easily be much greater than 100. In order to go up to 100 radians, the bulk of the Tables VII to XIII would have to be increased about thirty fold. Altogether, aside from the greatly increased bulk and expense of such tables, the extra time and effort consumed in turning over the numerous pages would be comparable with that saved by eliminating the preliminary step of quadranting the imaginary component or dividing it by $\pi/2$.

Rules for the Use of Table VII

Express the "angle" whose hyperbolic sine is required in the form of an ordinary rectangular complex quantity $x + iy$.

Quadrant the imaginary component y through the process of dividing it by $\pi/2$; *i.e.*, transfer the quantity from the XY to XQ plane; so that the new expression of the complex quantity is $x + iq$; where $q = y/1.57079\ldots$

If q is greater than 4.0, divide by 4 and retain only the remainder. If the remainder exceeds 2, subtract 2 therefrom, and apply a negative sign to the result found in the table. A change of 2 quadrants simply reverses the sign of the result. If the remainder on the other hand does not exceed 2, enter Table VII with it, and take out the result with unchanged sign.

Example: Required the hyperbolic sine of $0.65 + i\,25.75$. Here $x = 0.65$ and $y = 25.75$. That is y is 25.75 circular radians. Reduce this to quadrants through dividing by $1.57079\ldots$

$$\frac{25.75}{1.57079\ldots}{}^{*} \qquad \begin{aligned} \log 25.75 &= 1.4107772. \\ \log \pi/2 &= \underline{0.1961199.} \\ \log \underline{16.393} &= 1.2146573. \end{aligned}$$

The quadranted value $x + iq = 0.65 + i\,\underline{16.393}$

Note. — It is found convenient to underscore quadrantal quantities to distinguish them from radianal quantities.

Rejecting quadrant multiples of 4, *i.e.*, 16 in this case, we enter Table VII with $x + iq = 0.65 + i\,\underline{0.393}$. The nearest entry to this is $x = 0.65$, $q = 0.4$, for which the hyperbolic sine is $0.56368 + i\,0.71639$, an ordinary rectangular complex quantity on the $U\,V$ plane. Interpolation should be made in this result to meet the change from $q = \underline{0.40}$ to $q = \underline{0.393}$, as will be explained later.

$$\begin{aligned} \text{Second Example: Required } \sinh(x + iy) &= \sinh\ (1.15 + i\,10.10). \\ \text{Quadranting the imaginary, } \sinh(x + iq) &= \sinh\left(1.15 + i\,\frac{10.10}{1.5708}\right) \\ &= \sinh\ (1.15 + i\,\underline{6.430}). \\ \text{Rejecting 4's from the imaginary} &= \sinh\ (1.15 + i\,\underline{2.430}). \\ \text{Deducting 2 from the residual and changing the sign} \ldots\ldots &= -\sinh\ (1.15 + i\,\underline{0.430}). \end{aligned}$$

* This operation would ordinarily be effected with the slide-rule, when a high degree of precision is not aimed at.

We now enter Table VII with $x = 1.15$ and $q = \underline{0.43}$. The nearest entry is $x = 1.15$ $q = 0.45$, the result for which is $1.08037 + i\,1.12836$. But we must apply a negative sign to the whole of this result because of the 2 rejected in the quadrantal residuum. Hence,

$$\begin{aligned}\sinh(1.15 + i\,10.10) &= -(1.08037 + i\,1.12836)\\ &= -1.08037 - i\,1.12836 = u + i\,v\end{aligned}$$

except for the interpolation from $q = \underline{0.45}$ to $q = \underline{0.43}$. The operation of interpolation will be discussed later on.

Third Example: Required $\sinh(x + iy) = \sinh\ (3.60 + i\,18.1)$.

Quadranting the imaginary, $\sinh(x + iq) = \sinh\left(3.60 + i\dfrac{18.1}{1.5708}\right)$

$= \sinh\ (3.60 + i\,\underline{11.523})$.

Rejecting 4's from the quadrants $= \sinh\ (3.60 + i\,\underline{3.523})$.

Deducting 2 from the residual imaginary and changing the sign.............. $= -\sinh(3.60 + i\,\underline{1.523})$.

Entering Table VII with $x = 3.6$ and $q = 1.523$, the nearest entry is $x = 3.6$ and $q = 1.5$, for which the result is $-12.92978 + i\,12.94910$. But applying the negative sign to this result because of 2 deducted from the quadrantal imaginary, and we have finally: —

$$\begin{aligned}\sinh(3.60 + i\,18.1) &= -(-12.92978 + i\,12.94910)\\ &= 12.92978 - i\,12.94910 = u + iv\end{aligned}$$

except for the interpolated correction from $q = \underline{1.500}$ to $q = \underline{1.523}$, to be considered later.

Range of the Table

Table VII extends by steps of 0.05 in x up to $x = 3.95$, and in Table XIII up to $x = 4.0$. In y, the range is indefinitely great; because after dividing y by $\pi/2$ so as to reduce it to quadrant measure, all multiples of 4 are rejected. From 0 to 2, in the remainder, the table gives the result directly and from 2 to 4, by change of sign in the total. Cases of x greater than 4.0 are dealt with in connection with Table XIV.

Repetitions in the Table

$$\text{If } \sinh\left\{x + i\left(\frac{\pi}{2} - a\right)\right\} = u + iv \tag{57}$$

it is easy to show that:

$$\sinh\left\{x + i\left(\frac{\pi}{2} + a\right)\right\} = -u + iv. \tag{58}$$

It follows that in any column of Table VII, the entry for $q = (1 - a)$ is the same as that for $q = 1 + a$ except for a change in the sign of u. Consequently, the table might have been reduced to half its present size, if the responsibility for making this change of sign had been left to the reader. It was considered, however, that since the reader is already charged with the duty of applying a negative sign to the total result when the q

residuum lies between 2 and 4, the retention of the full size of the present table was warranted, especially as the duplication of the text in each column provides a certain check upon the numerical work of tabulation.

Interpolation by Simple Proportion

As a first approximation, interpolation may be effected by simple proportion, first in regard to x and second in regard to q.

Example: Required sinh (0.15 + i 0.25), having given:

sinh (0.2 + i 0.2) = 0.19148 + i 0.31522.	sinh (0.2 + i 0.3) = 0.17939 + i 0.46310.
sinh (0.1 + i 0.2) = 0.09526 + i 0.31056.	sinh (0.1 + i 0.3) = 0.08925 + i 0.45626.
Diff. for 0.1 x = 0.09622 + i 0.00466.	Diff. for 0.1x = 0.09014 + i 0.00684.
Diff. for 0.05x = 0.04811 + i 0.00233.	Diff. for 0.05x = 0.04507 + i 0.00342.
	sinh (0.15 + i 0.3) = 0.13432 + i 0.45968.
sinh (0.15 + i 0.2) = 0.14337 + i 0.31289.	sinh (0.15 + i 0.2) = 0.14337 + i 0.31289.
	Diff. for q 0.10 = − 0.00905 + i 0.14679.
	Diff. for q 0.05 = − 0.00453 + i 0.07340.
	sinh (0.15 + i 0.25) = 0.13885 + i 0.38629.
Correct value	= **0.13910 + i 0.38700.**

Interpolation by Taylor's Theorem

When a higher degree of precision is desired than that which can be expected by simple proportion, we may use Taylor's theorem in the following form: —

$$\sinh(\theta + \Delta\theta) = \sinh\theta + \Delta\theta\cosh\theta + \frac{(\Delta\theta)^2}{2!}\sinh\theta + \frac{(\Delta\theta)^3}{3!}\cosh\theta + \dots \quad (59)$$

$$\sinh\{(x+iy) + (\Delta x + i\Delta y)\} = \sinh(x+iy) + (\Delta x + i\Delta y)\cosh(x+iy)$$
$$+ \frac{(\Delta x + i\Delta y)^2}{2!}\sinh(x+iy) + \frac{(\Delta x + i\Delta y)^3}{3!}\cosh(x+iy) + \dots \quad (60)$$

Quadranting imaginaries on both sides; or transferring to the XQ plane,

$$\sinh\{(x+iq) + (\Delta x + i\Delta q)\} = \sinh(x+iq) + \{\Delta x + i(\pi/2)\Delta q\}\cosh(x+iq)$$
$$+ \frac{\{\Delta x + i(\pi/2)\Delta y\}^2}{2}\sinh(x+iq) + \frac{\{\Delta x + i(\pi/2)\Delta q\}^3}{3!}\cosh(x+iq) + \dots \quad (61)$$
$$= \sinh(x+iq) + \Delta'\theta\cosh(x+iq) + \frac{(\Delta'\theta)^2}{2!}\sinh(x+iq)$$
$$+ \frac{(\Delta'\theta)^3}{3!}\cosh(x+iq) + \dots$$

$$\text{where } \Delta'\theta = \Delta x + i\Delta y = \Delta x + i(\pi/2)\Delta q. \quad (62)$$

Example (1): With $\Delta q = 0$.

Required $\sinh (0.15 + i\,\underline{0.2})$, having given in Table VII and in Table VIII:

$$\sinh (0.1 + i\,\underline{0.2}) = 0.09526 + i\,0.31056.$$

$$\cosh (0.1 + i\,\underline{0.2}) = 0.95582 + i\,0.03095. \quad \text{Then by (60);}$$

$$\begin{aligned}
\sinh (0.15 + i\,\underline{0.2}) &= \sinh (0.1 + i\,\underline{0.2}) + 0.05 \cosh (0.1 + i\,\underline{0.2}) + \frac{0.0025}{2} \\
&\quad \sinh (0.1 + i\,\underline{0.2}) + \frac{0.00013}{6} \cosh (0.1 + i\,\underline{0.2}) \\
&= 0.09526 + i\,0.31056 + 0.05\,(0.95582 + i\,0.03095) \\
&\quad + 0.00125\,(0.09526 + i\,0.31056) + 0.00002\,(0.95582 + \\
&\quad i\,0.03095) \\
&= 1.00125\,(0.09526 + i\,0.31056) + 0.05002\,(0.95582 + i\,0.03095) \\
&= (0.09538 + i\,0.31095) + (0.04781 + i\,0.00155) \\
&= \mathbf{0.14319 + i\,0.31250}
\end{aligned}$$

which is the correct tabular value of $\sinh (0.15 + i\,0.2)$ in Table VII.

Example (2): With $\Delta x = 0$.

Required $\sinh (0.1 + i\,\underline{0.25})$, having given in Table VII and in Table VIII:

$$\sinh (0.1 + i\,\underline{0.2}) = 0.09526 + i\,0.31056.$$

$$\cosh (0.1 + i\,\underline{0.2}) = 0.95582 + i\,0.03095. \quad \text{Then by (62);}$$

$$\begin{aligned}
\sinh (0.1 + i\,\underline{0.25}) &= \sinh (0.1 + i\,\underline{0.2}) + i\,0.05 \times 1.5708 \times \cosh (0.1 + i\,\underline{0.2}) \\
&\quad + i^2 \frac{(0.05 \times 1.5708)^2}{2!} \sinh (1.0 + i\,\underline{0.2}) \\
&\quad + i^3 \frac{(0.05 \times 1.5708)^3}{3!} \cosh (1.0 + i\,\underline{0.2}) \\
&= 0.09526 + i\,0.31056 + i \times 0.07854\,(0.95582 + i\,0.03095) \\
&\quad - \frac{0.00617}{2}\,(0.09526 + 0.31056) \\
&\quad - i\frac{0.00048}{6}\,(0.95582 + i\,0.03095) \\
&= (0.09526 + i\,0.31056)\,(1 - 0.00309) \\
&\quad + i\,(0.95582 + i\,0.03095)\,(0.07854 - 0.00006) \\
&= 0.99691\,(0.09526 + i\,0.31056) + 0.07848\,(-\,0.03095 + i\,0.95582) \\
&= 0.09497 + i\,0.30960 - 0.00243 + i\,0.07501 \\
&= 0.09254 + i\,0.38461.
\end{aligned}$$

The tabular value is $\mathbf{0.09254 + i\,0.38460}$.

Example (3): Interpolation for both Δx and Δq.

Required $\sinh (0.15 + i\,\underline{0.25})$, having given

$$\sinh (0.1 + i\,\underline{0.2}) = 0.09526 + i\,0.31056 \text{ by Table VII}$$

$$\text{and } \cosh (0.1 + i\,\underline{0.2}) = 0.95582 + i\,0.03095 \text{ by Table VIII.}$$

Here $\Delta\theta$ in formula (59) $= (0.05 + i\,\underline{0.05})$

and $\Delta'\theta$ in formula (62) $= (0.05 + i\,(\pi/2) \times \underline{0.05}) = (0.05 + i\,0.07854)$.

Thus: —

$$\sinh (0.15 + i\,\underline{0.25}) = \sinh (0.1 + i\,\underline{0.2}) + \Delta'\theta \cosh (0.1 + i\,\underline{0.2}) + \frac{(\Delta'\theta)^2}{2!} \sinh (0.1 + i\,\underline{0.2}) + \ldots$$

$$\Delta'\theta = 0.05 + i\,0.07854.$$

$$(\Delta'\theta)^2 = + 0.0025 - 0.00617 + i\,0.00785$$

$$= - 0.00367 + i\,0.00785.$$

$$\frac{(\Delta'\theta)^2}{2} = - 0.00184 + i\,0.00393.$$

$$(\Delta'\theta)^3 = (0.05 + i\,0.07854)^3 = - 0.00080 + i\,0.00010.$$

$$\frac{(\Delta'\theta)^3}{6} = - 0.00013 + i\,0.00002.$$

$$\sinh (0.15 + i\,\underline{0.25}) = \sinh (0.1 + i\,\underline{0.2}) \left\{ 1 + \frac{(\Delta'\theta)^2}{2!} + \ldots \right\} + \cosh (0.1 + i\,\underline{0.2}) \left\{ \Delta'\theta + \frac{(\Delta'\theta)^3}{3!} + \ldots \right\}$$

$$= (0.09526 + i\,0.31056)(0.99816 + i\,0.00393) = 0.09386 + i\,0.31036$$

$$+ (0.95582 + i\,0.03095)(0.04987 + i\,0.07856) = 0.04524 + i\,0.07664$$

$$= 0.13910 + i\,0.38700.$$

The correct tabulated value is $= \mathbf{0.13910 + i\,0.38700}$.

Effects of Changes of Sign in the Entering Quantity

Table VII expresses the relation

$$\sinh (x + iq) = u + iv. \tag{63}$$

(*a*) If x be taken with negative sign, we have

$$\sinh (- x + iq) = - u + iv \tag{64}$$

so that changing the sign of the real component entering the table changes the sign of the real component in the result; but leaves the sign of the imaginary component unchanged.

(*b*) If q be taken with negative sign, we have

$$\sinh (x - iq) = u - iv \tag{65}$$

so that changing the sign of the imaginary component in the entering quantity changes the sign of the imaginary component in the result, leaving the sign of the real component unchanged.

(*c*) If both x and q be taken with negative sign, we have

$$\sinh (- x - iq) = \sinh \{ - (x + iq) \} = - u - iv = - (u + iv) \tag{66}$$

so that changing the sign of the total entering quantity changes the sign of the total result.

The facts may be summed up by saying that changes in the sign of the entering quantity produce corresponding changes of sign in the result.

Circular Sines of Complex "Angles"

Since, as is well known: —

$$\sin \theta = - i \sinh (i\theta) \tag{67}$$

we have

$$\sin (x + iy) = - i \sinh (ix - y) \tag{68}$$
$$= i \sinh (y - ix). \tag{69}$$

Consequently, in order to find the circular sine of the complex quantity $(x + iy)$, enter Table VII for sinh $(y + ix)$, which on being quadranted, becomes sinh $\{ y + ix/(\pi/2) \}$ and let the result be $(u + iv)$. Then sinh $(y - ix) = u - iv$ and sin $(x + iy) = v + iu$. In other words, invert the entering components, and then invert the components of the result.

Example: Required sin $(1 + i\,2)$ from Table VII. Here $\theta = (1 + i\,2)$.

Enter the Table with $-$ sinh $(i\theta)$ = sinh $(- i\theta)$ = sinh $(2 - i\,1)$.

Quadranting the imaginary, we enter the table with $(x - iq) = (2 - i\,\underline{0.6366})$. The nearest entry is $(2 - i\,\underline{0.65})$, for which the hyp. sine is given as $1.89503 - i\,3.20780$. Consequently, sin $(1 + i\,2) = 3.2078 + i\,1.89503$, except in so far as interpolation is needed to reduce sinh $(2 - i\,\underline{0.6366})$ from sinh $(2 - i\,\underline{0.65})$. In this way any circular sine of a complex quantity can always be obtained from the table of hyperbolic sines, between the limits of 0 and $\pm$ 4 in y, and of 0 and $\pm \infty$ in x.

Graphic Interpolation by Means of Charts VIIa, VIIb, VIIc

Charts VII–VIII a, b, and c, serve for the evaluation of either sinh $(x + iq)$ or cosh $(x + iq)$, according to the axis of reference selected. Thus, taking Chart VII–VIIIb, if this is held with the line SS as the axis of reference or initial line; then by comparison with the entries in Table VII, it will be found that sinh $(x + iq)$ can be read from it directly over the range $q = \underline{0}$ to $q = \underline{4}$, beyond which the values repeat themselves indefinitely. On the other hand, if the chart be turned through 90°, so as to bring the line CC as the axis of reference, it will be found by comparison with the entries of Table VIII, that cosh $(x + iq)$ can be read from it directly over the range $q = \underline{0}$ to $q = \underline{4}$.

Chart VII–VIIIa gives sinh $(x + iq)$ and cosh $(x + iq)$ for values of x up to about 0.9. Chart VII–VIIIb gives the corresponding results for values of x up to about $x = 2$. Finally, Chart VII–VIIIc provides for values of x up to $x = 4$. In all of these charts, interpolation can be made for both x and q to 0.01, by direct inspection. The graphs on these charts are undistorted, since they give complex functions as results, in rectangular coördinates. The curves therefore always intersect orthogonally, and they represent a confocal system of ellipses and hyperbolas, the common foci being at two points at unit distances from the center, along one of the reference axes. The curvilinear rectangles into which the charts are divided have pairs of sides the ratio of whose lengths tends to the value $\pi/2$.

If the preliminary process of quadranting the imaginary of the entering quantity were not adopted; that is, if the graphs were entered in terms of $(x + iy)$, instead of

$(x + iq)$; then it would be necessary* to have a new chart for each range of 2π units in y; or some 16 sets of Charts A, B, and C, in order to reach $y = 100$. That is, 48 charts would have to be computed, prepared, drawn, lithographed, bound, sold and operated instead of the 3 charts actually presented. Moreover, if y were needed greater than 100, the set of 48 would fail; whereas, working with quadrant imaginaries, the three charts serve up to indefinitely great values of q and y.

Graphic Chart VII–VIIIa

This chart corresponds to Tables VII and VIII at least as far as $x = 0.9$, or for pages 42 to 45, and 58 to 61 of this book. To find hyperbolic sines from the chart, place it facing the observer with the axis OO vertical. This is the major axis of all the ellipses shown. Starting from this central axis towards the right hand, the successive ellipses marked 0.1, 0.2, 0.3, etc., represent values of x; while the successively rising hyperbolas 0.1, 0.2, represent values of q. These values of q will be found to extend over two quadrants. Enter the chart on the curvilinear coördinates for x and q. At the proper intersection read off the u and v coördinates of the rectilinear ruling, u being the abscissas and v the ordinates.

Conversely, to find $\sinh^{-1}(u + iv)$ within the limits $u = 0$ and $u = \pm 1$, $v = 0$ to $v = 2.0$, enter the chart with the same aspect on the rectilinearly ruled coördinates and read off at the proper intersection the curvilinear values taking x on the ellipses and q on the hyperbolas.

To find hyperbolic cosines from the chart, rotate it clockwise 90°; so as to have the axis OO horizontal. Then enter on the curvilinear coördinates with x on the ellipses and q on the hyperbolas. The first and fourth quadrants only will be presented to the observer; but from the symmetry of the diagram, it will be easy to reverse the chart, so as to present the second and third quadrants. Read off the result on the rectilinear background using u for abscissas and v for ordinates.

Conversely, to find $\cosh^{-1}(u + iv)$ from the chart with the axis OO horizontal, enter on the rectilinear background and read off at the proper intersection from the curvilinear coördinates in x and q, taking the ellipses as parts of the x-system and the hyperbolas as part of the q-system.

Graphic Chart VII–VIIIb

This chart gives the graph of the functions $\sinh(x + iq)$ and $\cosh(x + iq)$ from $x = 0.8$ at least as far as $x = 2.05$ along the ellipses and from $q = 0$ to $q = \infty$ by virtue of successive rotations. In this and the following charts, the numerical values of q are all underscored, an indication which may serve readily to distinguish the imaginaries q, from the reals, x.

* A single set of charts entered in terms of $(x + iy)$ could be used up to $y = 6.2832$ in one revolution, and could be used for all larger values by throwing out multiples of 2π. This operation of dividing y by 2π would, however, take as much time as the operation of quadranting, and would also lead to a dissymmetrical chart in the hyperbolas.

In all of the Charts VII to IX inclusive, the curvilinear rectangles all tend to have sides in the ratio $\pi : 2$; that is the long side approximates to being 1.57 times the short side. In IXA exceptions are found; because extra curvilinear coördinates are supplied.

To find sinh $(x + iq)$ from Chart VII–VIIIB, hold the minor axis SS horizontal. Enter on the curvilinear coördinates with x on ellipses and q on hyperbolas. At the proper intersection read off on the rectilinear background in u and v. Proceed inversely to find the inverse function $\sinh^{-1}(u + iv)$.

To find cosh $(x + iq)$ from the same chart, hold the major axis CC horizontal. Enter on the curvilinear coördinates with x on ellipses and q on hyperbolas. Read off on the rectilinear background.

All four quadrants appear in this and the following chart, so that it is not necessary to limit the value of q to less than 2 quadrants.

Graphic Chart VII–VIIIc

This Chart gives the graph of sinh $(x + iq)$ and cosh $(x + iq)$ from $x = 2.0$, at least as far as $x = 3.90$. The procedure is precisely the same as that for VII–VIIIB already described.

TABLE VIII

$$\cosh(x + iq) = u + iv$$

Rectangular Hyperbolic Cosines of a Rectangular Variable

Table VIII may be regarded as an inversion of Table VII; because:

$$\cosh\theta = -i\sinh(\theta + i\pi/2) \qquad (70)$$

or in quadrant imaginaries,

$$\cosh\theta = -i\sinh(\theta + i\,\underline{1}). \qquad (71)$$

That is the hyp. cosine of any complex quantity $(x + iq)$ is $-i$ times the hyp. sine of that quantity with an additional quadrant in the imaginary. Thus

$$\begin{aligned}\cosh(0.5 + i\,0.6) &= -i\sinh(0.5 + i\,1.6)\\ &= -i(-0.42158 + i\,0.66280)\\ &= +0.66280 + i\,0.42158.\end{aligned}$$

All of the entries in Table VII thus reproduce themselves by inversion in corresponding parts of Table VIII, a fact which serves as a numerical check upon both.

In order to find the value of cosh $(x + iy)$, quadrant the imaginary quantity y, by dividing it with $\pi/2$, as in entering Table VII. The complex quantity $(x + iy)$ will now be expressed as $(x + iq)$; or will in effect have been transferred from the XY to the XQ plane. Next throw out multiples of 4 from q, so as to leave a remainder less than 4. If this remainder exceeds 2, deduct 2 from it, but change the sign of the total result thereupon deduced. If the remainder, however, is not greater than 2, then, the result is taken directly from the table.

Example: To find $\cosh(1 + i\,5\quad) = \cosh(x + iy)$.
Quadranting, we have $\cosh(1 + i\,\underline{3.183}) = \cosh(x + iq)$.
Deducting 2 from q, $\cosh(1 + i\,\underline{1.183})$.

With this we enter Table VIII. The nearest entry is $x + iq = 1 + i\,\underline{1.2}$, the result for which is $-0.47684 + i\,1.11768$. This has to be corrected by interpolation from $q = \underline{1.2}$ to $q = \underline{1.183}$. Reverse the sign of the result to $0.47684 - i\,1.11768$ for the deduction of 2 quadrants.

$$
\begin{aligned}
\text{Example 2: Required } \cosh(0.25 + i\,30\quad) &= \cosh(x + iy).\\
\text{Quadranting, this becomes } \cosh(0.25 + i\,\underline{19.099}) &= \cosh(x + iq).\\
\text{Rejecting imaginary quadruples} &= \cosh(0.25 + i\,\underline{3.099})\\
&= \cosh(x + iq).\\
\text{Deducting 2 quadrants} &= \cosh(0.25 + i\,\underline{1.099})\\
&= -\cosh(x + iq).
\end{aligned}
$$

The nearest entry is $0.25 + i\,\underline{1.1}$ for which the result is $(-0.16135 + i\,0.24950)$. Applying the negative sign on account of the two deducted quadrants, the final result is, neglecting interpolation,

$$\cosh(0.25 + i\,30) = 0.16135 - i\,0.24950 = u - iv.$$

Interpolation by Simple Proportion

A first approximation can be obtained by interpolating according to simple proportion.

Example: Required $\cosh(0.55 + i\,0.55) = \cosh(x + iq)$

having given

$$
\begin{aligned}
\cosh(0.6 + i\,\underline{0.5}) &= 0.83825 + i\,0.45018.\\
\cosh(0.5 + i\,\underline{0.5}) &= 0.79735 + i\,0.36847.\\
\text{Diff. for } x\ 0.1 &= 0.04090 + i\,0.08171.\\
\text{Diff. for } x\ 0.05 &= 0.02045 + i\,0.04086.\\
\cosh(0.55 + i\,\underline{0.5}) &= 0.81780 + i\,0.40933.
\end{aligned}
$$

$$
\begin{aligned}
\cosh(0.6 + i\,\underline{0.6}) &= 0.69680 + i\,0.51506.\\
\cosh(0.5 + i\,\underline{0.6}) &= 0.66280 + i\,0.42158.\\
\text{Diff. for } x\ 0.1 &= 0.03400 + i\,0.09348.\\
\text{Diff. for } x\ 0.05 &= 0.01700 + i\,0.04674.\\
\cosh(0.55 + i\,\underline{0.6}) &= 0.67980 + i\,0.46832.\\
\cosh(0.55 + i\,\underline{0.5}) &= 0.81780 + i\,0.40933.\\
\text{Diff. for } q\ \underline{0.1} &= -0.13800 + i\,0.05899.\\
\text{Diff. for } q\ \underline{0.05} &= -0.06900 + i\,0.02950.\\
\cosh(0.55 + i\,\underline{0.55}) &= 0.74880 + i\,0.43883.\\
\text{Correct value} &= \mathbf{0.75018 + i\,0.43963}.
\end{aligned}
$$

Interpolation by Taylor's Theorem

For a higher degree of precision than simple proportion affords, reference may be had to Taylor's theorem in the following form: —

$$\cosh(\theta + \Delta\theta) = \cosh\theta + \Delta\theta\sinh\theta + \frac{(\Delta\theta)^2}{2!}\cosh\theta + \frac{(\Delta\theta)^3}{3!}\sinh\theta + \dots$$

$$
\begin{aligned}
\cosh\{(x + iy) + (\Delta x + i\,\Delta y)\} &= \cosh(x + iy) + (\Delta x + i\,\Delta y)\sinh(x + iy)\\
&+ \frac{(\Delta x + i\,\Delta y)^2}{2!}\cosh(x + iy) + \frac{(\Delta x + i\,\Delta y)^3}{3!}\sinh(x + iy) + \dots \qquad (71a)
\end{aligned}
$$

Quadranting imaginaries on both sides, or transferring to the XQ plane,

$$\cosh \{ (x + iq) + (\Delta x + i\,\Delta q) \} = \cosh (x + iq) + (\Delta x + i\,\Delta q\ \pi/2) \sinh (x + iq) + \frac{(\Delta x + i\,\Delta q\ \pi/2)^2}{2!} \cosh (x + iq) + \frac{(\Delta x + i\,\Delta q\ \pi/2)^3}{3!} \sinh (x + iq) + \ldots$$

$$= \cosh (x + iq) + \Delta'\theta \sinh (x + iq) + \frac{(\Delta'\theta)^2}{2!} \cosh (x + iq) + \ldots$$

$$\text{where } \Delta'\theta = (\Delta x + i\,\Delta y) = (\Delta x + i\,\Delta q\ \pi/2). \qquad (71b)$$

Example: Required $\cosh (0.5 + i\,\underline{0.55}) = \cosh (x + iq)$
having given $\cosh (0.5 + i\,\underline{0.5}) = 0.79735 + i\,0.36847$ in Table VIII
and $\sinh (0.5 + i\,\underline{0.5}) = 0.36847 + \ 0.79735$ in Table VII.

Here $\Delta x = 0$, $\Delta q = i\,\underline{0.05}$, $\Delta'\theta = i\,\underline{0.05} \times 1.5708 = i\,0.07854$.

$$\cosh (0.5 + i\,\underline{0.55}) = \cosh (0.5 + i\,\underline{0.5}) \left\{ 1 + \frac{(\Delta'\theta)^2}{2!} + \frac{(\Delta'\theta)^4}{4!} + \ldots \right\} + \sinh (0.5 + i\,\underline{0.5}) \left\{ \Delta'\theta + \frac{(\Delta'\theta)^3}{3!} + \ldots \right\}.$$

$$\Delta'\theta = i\,0.07854.$$

$$(\Delta'\theta)^2 = -\,0.00617. \qquad \frac{(\Delta'\theta)^2}{2!} = -\,0.00309.$$

$$(\Delta'\theta)^3 = -\,i\,0.00048. \qquad \frac{(\Delta'\theta)^3}{3!} = -\,i\,0.00008.$$

$$(\Delta'\theta)^4 = +\,0.00004. \qquad \frac{(\Delta'\theta)^4}{4!} = 0.00000.$$

$$\cosh (0.5 + i\,\underline{0.55}) = (0.79735 + i\,0.36847)\ (1 - 0.00309) + (0.36847 + i\,0.79735)\ (i\,0.07854 - i\,0.00008)$$

$$= (0.79735 + i\,0.36847)\ 0.99691 + (0.36847 + i\,0.79735)\ i\,0.07846$$

$$= 0.79489 + i\,0.36733 + i\,0.02891 - 0.06256$$

$$= 0.73233 + i\,0.39624.$$

The tabulated value $= \mathbf{0.73233 + i\,0.39624.}$

In view of the similarity of the interpolation operations by Taylor's theorem to those already discussed in relation to Table VII, further examples are probably not needed.

Effects of Changes of Sign in the Entering Quantity

Since if

$$\cosh (\ \ x + iy) = u + iv \qquad (72)$$

$$\cosh (-\,x + iy) = u - iv \qquad (73)$$

$$\cosh (\ \ x - iy) = u - iv \qquad (74)$$

$$\cosh (-\,x - iy) = u + iv \qquad (75)$$

changing the sign of either the real or imaginary entering component only changes the sign of the imaginary component in the result; while changing the sign of the entering quantity as a whole, has no effect on the sign of the result.

Circular Cosines of Complex "Angles"

It is well known that if θ be any angle, real or complex,

$$\cos \theta = \cosh (i\theta). \quad (76)$$

Consequently,

$$\cos (x + iy) = \cosh (-y + ix) \quad (77)$$

or, quadranting the imaginary component,

$$\cos (x + iy) = \cosh (-y + i\, 2x/\pi) = u + iv. \quad (78)$$

To find the circular cosine of any complex quantity $x + iy$, we enter Table VIII with $(-y + i\, x/1.5708)$. The result is the desired cosine.

Example: Required $\cos (0.4 + i\, 1.2)$.

Thus we require $\cosh (-1.2 + i\, \underline{0.2546})$.

We now enter Table VIII with $x = -1.2$ and $q = \underline{0.2546}$ the nearest entry being $x = -1.2$ and $q = \underline{0.25}$, for which the result is $1.67283 - i\, 0.57765$.

Hence $\cos (0.4 + i\, 1.2) = 1.67283 - i\, 0.57765$ neglecting interpolation from $q = \underline{0.25}$ to $q = \underline{0.2546}$.

Graphic Chart Interpolations

The use of the Graphic Charts VII–VIIIA, B, C, for hyperbolic cosines has already been described in connection with sines, on pages 197–198.

TABLE IX

$\tanh (x + iq) = u + iv$

Rectangular Hyperbolic Tangents of a Rectangular Variable

Entering Process

Let $\tanh (x + iy)$ be the required function. Quadrant the imaginary component, as described under Tables VII and VIII; that is, divide y by $\pi/2$; so that $y/(\pi/2) = q$. The required function is now expressed in the form $\tanh (x + iq)$. Throw out multiples of 2 from q and retain only the remainder as q. Enter Table IX with $(x + iq)$, and find the result directly as $u \pm iv$. It is a well-known property of $\tanh (x + iy)$, that it is periodic in iy, and that the period is $i.\pi$ circular radians; or, in quadrants, $i.2$. That is

$$\tanh \{ x + i (y + n\pi) \} = \tanh (x + iy). \quad (79)$$

where n is any integer; or, in quadrant measure of the imaginary,

$$\tanh \{ x + i (q + \underline{2n}) \} = \tanh (x + iq). \quad (80)$$

Example: Required $\tanh (0.25 + i\, 30) = \tanh (x + iy)$.
Quadranting, $\tanh (0.25 + i\, \underline{19.099}) = \tanh (x + iq)$.
Rejecting multiples of 2, $\tanh (0.25 + i\, \underline{1.099}) = \tanh (x + iq)$.

We now enter Table IX with $x = 0.25$ and $q = \underline{1.099}$, the nearest entry to which $x = 0.25$, $q = \underline{1.1}$. The result is $2.95122 - i\, 1.75011$.

Interpolation

Interpolation may be approximately effected by simple proportion, first in x and then in q, as indicated in connection with Tables VII and VIII; or, when a higher degree of precision is required, recourse may be had to Taylor's theorem in the following form: —

$$\tanh(\theta + \Delta\theta) = \tanh\theta + \Delta\theta \operatorname{sech}^2\theta - \frac{(\Delta\theta)^2}{2!}\, 2 \operatorname{sech}^2\theta \tanh\theta$$
$$+ \frac{(\Delta\theta)^3}{3!}\, 2 \operatorname{sech}^2\theta\,(2\tanh^2\theta - \operatorname{sech}^2\theta) + \ldots \tag{81}$$

or

$$\tanh\{(x + iy) + (\Delta x + i\Delta y)\} = \tanh(x + iy) + \frac{(\Delta x + i\Delta y)}{\cosh^2(x + iy)}$$
$$- \frac{(\Delta x + i\Delta y)^2}{\cosh^2(x + iy)} \tanh(x + iy) + \ldots \tag{82}$$

and quadranting,

$$\tanh\{(x + iq) + (\Delta x + i\Delta q)\} = \tanh(x + iq) + \frac{\{\Delta x + i\Delta q\,(\pi/2)\}}{\cosh^2(x + iq)}$$
$$- \frac{\{\Delta x + i\Delta q\,(\pi/2)\}^2}{\cosh^2(x + iq)} \tanh(x + iq) + \ldots \tag{83}$$

so that as far as the second correction term: —

$$\tanh\{(x + iq) + (\Delta x + i\Delta q)\} = \tanh(x + iq) + \frac{\Delta'\theta}{\cosh^2(x + iq)}$$
$$- \frac{(\Delta'\theta)^2 \tanh(x + iq)}{\cosh^2(x + iq)} + \ldots \tag{84}$$

$$\text{where } \Delta'\theta = (\Delta x + i\Delta y) = \{\Delta x + i\Delta q\,(\pi/2)\} \tag{85}$$

Example: Required $\tanh(0.5 + i\,\underline{0.55}) = \tanh(x + iq)$

having given $\cosh(0.5 + i\,\underline{0.5}) = 0.79735 + i\,0.36847$ by Table VIII

$= 0.87837\,\underline{/24^\circ.803}$ by Table XI

and $\tanh(0.5 + i\,\underline{0.5}) = 0.76159 + i\,0.64805$ by Table IX

$= 1.0\,\underline{/40^\circ.395}$ by Table XII.

Here $\Delta'\theta = (0 + i\,0.05 \times 1.5708) = (0 + i\,0.07854)$.

$$\tanh(0.5 + i\,\underline{0.55}) = 0.76159 + i\,0.64805 + \frac{i\,0.07854}{(0.87837)^2\,\underline{/49^\circ.606}} + \frac{0.00617 \times 1\,\underline{/40^\circ.395}}{(0.87837)^2\,\underline{/49^\circ.606}}$$
$$= 0.76159 + i\,0.64805 + \frac{0.07854\,\underline{/40^\circ.394}}{0.77153} + \frac{0.00617\,\overline{\backslash 9^\circ.211}}{0.77153}$$
$$= 0.76159 + i\,0.64805 + 0.10180\,\underline{/40^\circ.394} + 0.00800\,\overline{\backslash 9^\circ.211}$$
$$= 0.76159 + i\,0.64805 + 0.07753 + i\,0.06597 + 0.00790 - i\,0.00128$$
$$= 0.84702 + i\,0.71274.$$

The correct value is $0.84752 + i\,0.71229$.

As the third correction term is inconvenient for computation, it is often preferable to obtain a precise interpolation of $\tanh(x + iy)$ in working out the correct interpolations of $\sinh(x + iy)$ and $\cosh(x + iy)$ by the methods already illustrated, and then to take their ratio.

Effects of Changes of Sign in the Entering Quantity

If $\tanh(\ \ x + iy) \qquad u + iv$ (86)

then $\tanh(\ \ x - iy) = \ \ u - iv$ (87)

$\tanh(-x + iy) = -u + iv$ (88)

and $\tanh(-x - iy) = -(u + iv).$ (89)

Consequently, changes in the sign of the entering quantity produce corresponding changes of sign in the result.

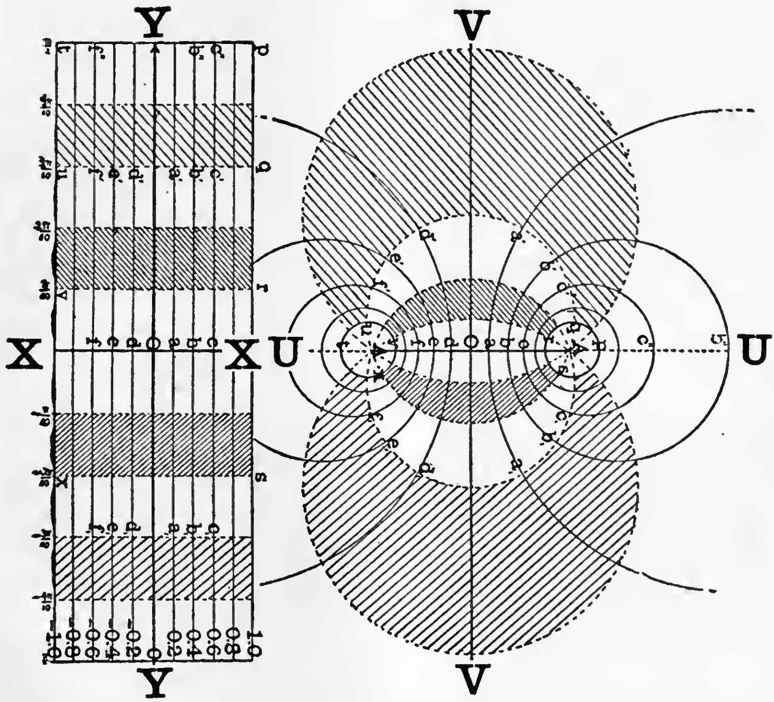

Fig. 32. — Graphs of $x + iy$ and $\tanh(x + iy)$ in the XY and UV planes respectively.

Circular Tangents of Complex "Angles"

Since $\tan\theta = -i\tanh(i\theta).$ (90)

It follows that $\tan(x + iy) = -i\tanh(-y + ix)$ (91)

or, quadranting the imaginary: —

$$\begin{aligned}\tan(x + iy) &= -i\tanh(-y + i\,2x/\pi) = -i\tanh(-y + iq)\\ &= -i(-u + iv)\\ &= v + iu.\end{aligned} \qquad (92)$$

Consequently, to find $\tan(x - iy)$ from Table IX, enter it with y as x and with $x/(\pi/2)$ as q. Invert the components of the result and the required function is obtained. Thus required tan $(1 + i\,2)$. We enter with $x = 2$ and $q = \underline{0.6366}$. The nearest entry is $x = 2.0$ and $q = \underline{0.65}$ for which $u + iv = 1.01623 + i\,0.03318$. Therefore, inverting,

$$\tan(1 + i\,2) = 0.03318 + i\,1.01623$$

neglecting the interpolation from $q = \underline{0.65}$ to $q = \underline{0.6366}$.

Graphic Interpolation by Means of Charts IXa, IXb, and IXc

These charts contain all of the entries in Table IX, and also a certain number of additional results. They present circles intersecting circles orthotomically; *i.e.*, by rectangular intersection. It is clear that for values of x less than 0.10, the curves run off Chart IXa. In fact the first curve shown of $x = 0.01$ extends as far as $u = 100$. By taking x small enough, the corresponding values of u and v may become indefinitely great. The entire UV plane is covered to infinity once between $x = 0$ and $x = \infty$, $q = 0$ and $q = \underline{2}$. It is covered once more for each 2 quadrants increase in q.

When entering for $\tanh(-x \pm iq)$; or for the inverse operation $\tanh^{-1}(-u \pm v)$, it must be remembered that the confocal conic-section diagrams VII and VIII are complete for negative as well as for positive values of x and q; but that only half of the UV plane is presented in Charts IX. The full graph is indicated in Fig. 32, by the aid of which the functions corresponding to negative real values are readily apprehended.

TABLE X

$$\sinh(x + iq) = r\,\underline{/\gamma}$$

Polar Hyperbolic Sines of a Rectangular Variable

This table corresponds completely to Table VII, already considered, except that it offers results in polar instead of rectangular coördinates.

To find $\sinh(x + iy)$ expressed in polar coördinates, quadrant the imaginary, and express the entering variable as $(x + iq)$. Reject multiples of 4 in q, and if the remainder exceeds 2, reject 2 but change the sign of the total result.

Interpolation by Simple Proportion

Required $\sinh(0.15 + i\,\underline{0.25})$ having given

$\sinh(0.2 + i\,\underline{0.2}) =$	$0.36882\,\underline{/58^\circ.723}$.	$\sinh(0.2 + i\,\underline{0.3}) =$	$0.49663\,\underline{/68^\circ.825}$.
$\sinh(0.1 + i\,\underline{0.2}) =$	$0.32485\,\underline{/72^\circ.947}$.	$\sinh(0.1 + i\,\underline{0.3}) =$	$0.46491\,\underline{/78^\circ.932}$.
Diff. for $0.1\,x =$	$+0.04397\,\underline{/-14^\circ.224}$.	Diff. for $0.1\,x =$	$+0.03172\,\underline{/-10^\circ.107}$.
Diff. for $0.05\,x =$	$0.02199\,\underline{/-\ 7^\circ.112}$.	Diff. for $0.05\,x =$	$0.01586\,\underline{/-\ 5^\circ.054}$.
		$\sinh(0.15 + i\,\underline{0.3}) =$	$0.48077\,\underline{/73^\circ.878}$.
$\sinh(0.15 + i\,\underline{0.2}) =$	$0.34684\,\underline{/65^\circ.835}$.	$\sinh(0.15 + i\,\underline{0.2}) =$	$0.34684\,\underline{/65^\circ.835}$.
		Diff. for $i\,0.1 =$	$0.13393\,\underline{/\ 8^\circ.043}$.
		Diff. for $i\,\underline{0.05} =$	$0.06697\,\underline{/\ 4^\circ.022}$.
		$\sinh(0.15 + i\,\underline{0.25}) =$	$0.41381\,\underline{/69^\circ.857}$.
		Correct Value	**$0.41124\,\underline{/70^\circ.229}$.**

Interpolation by Taylor's Theorem

For a higher degree of precision than is obtainable by simple proportion, it is convenient to use rectangular coördinates and apply formula (62). Thus, required sinh $(0.15 + i\,0.25)$. Here referring to Table VII and to the work on page 195, we find for the result $u + iv = 0.13911 + i\,0.38701$.

Here	$\log 0.38701 = 1.5877110$	$70°.13'.\frac{72}{100} = 70°.229$	$\log 0.13911 = 1.1433584$
	$\log 0.13911 = \underline{1.1433584}$		$\log \sec. 70°.229 = \underline{0.4707400}$
	0.4443526		$\log 0.41124 = 1.6140984$
	$\log \tan 70°.13' = 0.4440674$	Result	$0.41124 \underline{/70°.229.}$
	$0.72 = \frac{2853}{3968}$	Correct Value	**$0.41124 \underline{/70°.229.}$**

Interpolation by Charts X-XIa and X–XIb

These charts present the polar coördinate results on rectangular coördinate sheets, so that they are not true graphs, but are merely to be regarded as interpolation diagrams.

To find sinh $(x + iy)$, proceed as in the use of the tables and quadrant the imaginary so as to obtain the entering quantity in the form $(x + iq)$. Enter with the curvilinear coördinates, taking the more nearly vertical wavy lines for x and the more nearly horizontal lines for q, starting from the line SS as the zero of q. Read off the result on the rectangular background to the left-hand scale of ordinates.

When we leave X–XIa and enter X–XIb, it is noticeable that the curves of constant x approach vertical straight lines and the curves of constant q approach horizontal straight lines. At and beyond $x = 3.0$, we may approximate to the modulus r at any required q, by taking the value of r at $q = 0.5$ and simple proportional parts between this and r at $q = 0$ or r at $q = 1.0$. The change in modulus r between $q = \underline{0.5}$, and either of the above limits is very nearly $\epsilon^{-x}/2$. Thus at $x = 3.5$ and $q = \underline{0.5}$, r by the tables is 16.55774. At $q = \underline{0}$, $r = 16.54263$, a change of -0.01511, and at $q = \underline{1.0}$ $r = 16.57282$, a change of $+0.01508$. The value of $\epsilon^{-3.5}/2$ will be found to be 0.01510, and over the entire range of q from 0 to $\underline{1.0}$, the change in r follows in nearly simple proportion.

Beyond $x = 3.2$, the limit of Chart X–XIb, the values of r can be obtained by the above rule applied to Table X and with the aid of Chart VII–VIIIc. The values of the amplitude γ beyond $x = 3$ closely approximate to q quadrants. That is sinh $(x + iq)$ approximates to $\frac{\epsilon^x}{2} \underline{/q}$, with q in quadrant measure.

TABLE XI

$$\cosh (x + iq) = r \underline{/\gamma}$$

Polar Hyperbolic Cosines of a Rectangular Variable

Table XI corresponds completely with Table VIII, except that it gives results expressed in polar instead of rectangular coördinates. It is entered with $(x + iq)$ just as in Table VIII.

Interpolation may be effected by simple proportion, as in the case of Table X, or when a higher degree of precision is required, it may be carried on by Taylor's theorem. In the latter case, it is more convenient to refer to the corresponding entries in Table VIII, interpolating according to formula (71*b*). The rectangular coördinates duly interpolated are then transformed into polar coördinates, as in the last example on page 225.

Interpolation by Charts X–XIa and X–XIb

When Charts X–XI are used to find cosh $(x + iy)$, the imaginary is first quadranted by dividing with $\pi/2$, so as to obtain the entering variable in the form cosh $(x + iq)$. Starting then from $q = \underline{0}$ at the horizontal line *CC*, near the middle of the chart, the underscored figures correspond to q for a little more than the first quadrant. The manifest repetition of the curves enables the lower half of the sheet, however, to be used for the second quadrant. The result is read off on the rectangular background to the right-hand scale of argument.

Beyond $x = 3.2$, the limit of Chart X–XIb reference may be had to Chart VII–VIIIb; or the approximate formula may be used:

$$\cosh (x + iq) = \frac{\epsilon^x}{2} \underline{/q}. \qquad (93)$$

the argument q of the result being interpreted in quadrant measure and converted into degrees.

TABLE XII

$$\tanh (x + iq) = r \underline{/\gamma}$$

Polar Hyperbolic Tangents of a Rectangular Variable

Table XII corresponds completely with Table IX, except that it gives results expressed in polar instead of rectangular coördinates.

If we desire to find tanh $(x + iy)$, we must first divide y by $\pi/2$ so as to obtain the entering quantity in the form $(x + iq)$. Multiples of 2 are then rejected in q leaving a remainder less than 2. With this remainder the table is entered.

Interpolation may be made by simple proportion to a moderate degree of precision.

Graphic Interpolation by Means of Charts XIIa, b, c, d

These charts cover between them the full range of Table XII. To find tanh $(x + iq)$ from them with q less than 2, find the proper chart, and enter on the curvilinear coordinates keeping the underscored number for q. Read off the result on the rectilinear background.

For tan $(x + iy)$ and also for the effects of changes of sign, see directions in the discussion on Table IX.

To find $\tanh^{-1} (r \underline{/\gamma})$, enter immediately on the rectangular background of r and γ in the proper chart, and read off at the correct intersection the corresponding values on the curvilinear coördinates. The result will appear in terms of $(x + iq)$. The imaginary q must be dequadranted, or multiplied by $\pi/2$, in order to be expressed in terms of $(x + iy)$.

TABLE XIII

$$f(4 + iq) = u + iv \text{ or } r \underline{/\gamma}$$

Rectangular and Polar Functions of the Rectangular Variable $(4 + iq)$

In this table the hyperbolic sine, cosine and tangent of $(4 + iq)$ are collected from $q = \underline{0}$ to $q = \underline{2.0}$. The results are expressed both in rectangular coördinates $(u + iv)$, and in polar coördinates $r \underline{/\gamma}$.

It will be seen that the moduli of the tangents vary between 0.99933 and 1.00067, or differ from unity by two thirds of one per mil, at most. The arguments also differ from 0° by less than 0.04°, or about 2′.17″ of arc.

Beyond $x = 4$, it is evident that the hyp. sine and cosine differ by so small a percentage, that no tabulation of these differences would ordinarily be required.

TABLE XIV

$$\epsilon^x/2 \text{ and } \log_{10}(\epsilon^x/2)$$

Semi-Exponentials

This table enables the hyp. sine or cosine of any rectangular variable $(x + iq)$ to be found for values of x greater than 4 and less than 10. It is shown in the preceding table that when x reaches 4, the ratio of the sine to the cosine never differs from unity by more than two-thirds of 1 per mil. This deviation from unity rapidly diminishes as x is further increased. Consequently, the sine and cosine may each be computed from the formula.

$$\sinh(x + iq) = \cosh(x + iq) = \frac{\epsilon^x}{2} \underline{/q}. \qquad (94)$$

Example: Required the value of $\sinh(8.51 + i\,25.75)$. The first step is to quadrant the imaginary by dividing with $\pi/2$, as on page 191. This gives the required function in the form $\sinh(8.51 + i\,\underline{16.393})$. Rejecting multiples of 4.0 in q, we may then write it $\sinh(8.51 + i\,\underline{0.393})$. Turning to the top of page 143, we find $\epsilon^x/2 = 2482.082$ for $x = 8.51$; so that the result is $2482.082 \underline{/0.393}$ quadrant. Expressing the argument in degrees by multiplying with 90 and we have $0.393 \times 90 = 35.37°$. Thus

$$\sinh(8.51 + i\,\underline{16.393}) = \cosh(8.51 + i\,\underline{16.393}) = 2482.082 \underline{/35°.37}.$$

Interpolation in x

Since
$$\frac{\epsilon^{x+\Delta x}}{2} = \frac{\epsilon^x}{2}\epsilon^{\Delta x} = \frac{\epsilon^x}{2}\left\{1 + \Delta x + \frac{(\Delta x)^2}{2!} + \frac{(\Delta x)^3}{3!} + \cdots\right\} \qquad (95)$$

it follows that when Δx is a small quantity, it suffices to multiply the tabular value of $\epsilon^x/2$ by $(1 + \Delta x)$ in order to arrive at the interpolated result unless $(\Delta x)^2/2!$ the second correction term, is of sufficient magnitude to need consideration.

Example: To find sinh $(8.51 + iq)$, having given that sinh $(8.50 + iq) = 2457.383 \underline{/q}$. Here $\Delta x = 0.01$.

$$2457.383 \times \quad 1 = 1 \qquad 2457.383$$
$$2457.383 \times \Delta x = 0.01 \qquad 24.574$$
$$2457.383 \times \frac{(\Delta x)^2}{2} = 0.00005 \qquad .123$$
$$2482.080$$

Result $2482.080 \underline{/q}$.
Tabulated value $\underline{2482.082} \underline{/q}$.

TABLE XV

$f(x + i\,0)$

Real Hyperbolic Functions

This is a short table of real, as distinguished from complex hyperbolic functions for convenience of reference. It was prepared and published by the author in 1903 in relation to continuous-current electric circuit applications, taking the sines, cosines, and tangents from Ligowski's tables, and adding the corresponding computed reciprocals for the cosecants, secants, and cotangents. Much more extensive tables of real hyperbolic functions are, however, available. See Bibliography, page 211.

TABLE XVI

Subdivisions of a Degree

This is a short table for convenience in changing the expression of a circular angle from decimals of a degree to minutes and seconds, or inversely. By its aid, three-decimal subdivisions of a degree may be converted into minutes and seconds of arc, by direct inspection; or minutes and seconds may be read off as decimals of a degree to three-digit accuracy.

Methods Employed in Computation

Tables I to V, inclusive, were computed as one group, and Tables VII to XIII, inclusive, as a separate group.

Tables I to V were computed, at first, by using the formulas: —

$$\sinh(x + iy) = \sqrt{\sinh^2 x + \sin^2 y}\ \underline{/\tan^{-1}(\tan y \,/\, \tanh x)} = r_1 \underline{/\gamma_1}. \qquad (96)$$

$$\cosh(x + iy) = \sqrt{\cosh^2 x - \sin^2 y}\ \underline{/\tan^{-1}(\tan y \cdot \tanh x)} = r_2 \underline{/\gamma_2}. \qquad (97)$$

$$\tanh(x + iy) = (r_1/r_2)\ \underline{/\gamma_1 - \gamma_2}. \qquad (98)$$

At a later stage of the work, the following formulas, kindly suggested by Professor Bouton, were substituted: —

$$\sinh(x + iy) = \sqrt{\cosh 2x} \cdot \sin z\ \underline{/\tan^{-1}(\tan y \,/\, \tanh x)} = r_1 \underline{/\gamma_1}. \qquad (99)$$

$$\cosh(x + iy) = \sqrt{\cosh 2x} \cdot \cos z\ \underline{/\tan^{-1}(\tan y \cdot \tanh x)} = r_2 \underline{/\gamma_2}. \qquad (100)$$

$$\tanh(x + iy) = \tan z\ \underline{/\gamma_1 - \gamma_2}. \qquad (101)$$

Where the auxiliary circular angle z is defined by:

$$\frac{\cos 2y}{\cosh 2x} = \cos 2z. \tag{102}$$

The arithmetical work was conducted with the aid of five-place logarithms, and was checked by tabulating successive first and second differences in the tabulated results.

Tables VII to XII were computed by means of the following formulas: —

$$\sinh (x + iy) = \sinh x \cos y + i \cosh x \sin y. \tag{103}$$

$$\cosh (x + iy) = \cosh x \cos y + i \sinh x \sin y. \tag{104}$$

$$\tanh (x + iy) = \frac{\sinh 2x}{\cosh 2x + \cos 2y} + i \frac{\sin 2y}{\cosh 2x + \cos 2y}. \tag{105}$$

A standard schedule was prepared and seven-place logarithms used in the computation. The value of tanh $(x + iy)$ was arrived at in two ways, first by dividing (103) by (104), and second by the independent formula (105). If these two methods did not give identical results for tanh $(x + iy)$ to five decimal places, when expressed both in rectangular and polar coördinates, the steps of the computation were gone over afresh.* Complete agreement being secured, leads to the inference that the values of sinh, cosh, and tanh $(x + iy)$ are correct, at least as far as their logarithms.

Finally, all of the tables have been reduced to graphic form in the Atlas, each entry of the tables being marked off on its proper chart with a sharp needle, and the ruling pen drawn through the successive punctures. In this process a certain number of errors were discovered and rectified. The tables were then set up in type from the MSS. used in making the charts, and were proofread three times. By this procedure it is hoped that the outstanding errors are neither large nor numerous.

Bibliography and Applications of Hyperbolic Functions

Hyperbolic functions of a real variable are employed extensively in mathematics generally. In particular, they are used in the solution of cubic equations.

In navigation, real hyperbolic functions enter in connection with Mercator sailing.

In cartography, real hyperbolic functions are used in preparing maps on certain projections, especially on Mercator's projection, which appears to have been the first application of hyperbolic functions.

In statics, real hyperbolic functions naturally present themselves in relation to the properties of the catenary and of the funicular polygon; also in the discussion of the forms and stresses of elastic bodies.

In dynamics, the same functions present themselves in the theory of vibrations, and in the motion of bodies through a resisting medium.

* The author desires to express his acknowledgement of the care and painstaking effort of his assistants engaged in computation, namely,

Miss Ethel Smith, A.B. Radcliffe, 1911.
Miss A. F. Daniell, A.B. Radcliffe, 1911.
Miss Mary M. Devlin, A.B. Radcliffe, 1912.
Miss Hope M. Hearn, A.B. Radcliffe, 1912.

A good summary of the historical development of real hyperbolic functions is given in Becker and van Orstrand's "Hyperbolic Functions," Smithsonian Mathematical Tables, 1909, together with a fine compendium of formulas involving these functions.*

In electrical engineering, the earliest published application of real hyperbolic functions is perhaps in T. H. Blakesley's "Alternating Currents of Electricity," London, 1889, which also appends a short table of these (real) functions. The real functions were also introduced by Sir J. J. Thomson, in "The Electrician," Vol. XXVIII, page 599, 1891. "On the Heat Produced by Eddy Currents in an Iron Plate Exposed to an Alternating Magnetic Field."

The fundamental differential equation of the alternating potential-current, steady-state distribution along a uniform conductor, involving hyperbolic functions, nominally real, seems to have been first published by O. Heaviside in 1893, "Electromagnetic Theory," Vol. I, page 450.

The first published application of complex hyperbolic functions to the last-named problem was by the author, "On the Fall of Pressure in Long-Distance Alternating-Current Conductors," *Electrical World*, N. Y., Vol. XXIII, page 17, January, 1894, and "The Electrician," London (abstract), Vol. XXXII, page 239, January 5, 1894.

Complex hyperbolic functions also present themselves in the discussion of Hertzian-wave reflections, and in other branches of electrical engineering. They naturally enter the subject of confocal ellipses and hyperbolas, such as Captain Weir's Azimuth diagram of these confocals, for indicating the azimuth of a celestial object in terms of the hour-angle, latitude and declination. (Godfray's "Astronomy," § 222.)

The mathematical discussion of hyperbolic functions is found in Greenhill's "Differential and Integral Calculus," Macmillan and Co., 1896; Ligowski's "Tafeln der Hyperbelfunctionen und der Kreisfunctionen," Berlin, Ernst & Korn, 1890; McMahon's "Hyperbolic Functions," Wiley and Sons, N. Y., 1896; Becker and van Orstrand's "Hyperbolic Functions," Smithsonian Institution, 1909; Vassall's "Nouvelles Tables des Logarithmes," Paris, Gauthier-Villars, 1872; as well as other text-books.

Works dealing with the applications of hyperbolic functions to electrical engineering are: "The Application of Hyperbolic Functions to Electrical Engineering Problems," by the author, The University of London Press, 1911, and Fleming's "The Propagation of Electrical Currents in Telephone and Telegraph Conductors," Constable & Co., London, 1911.

A three-dimensional complex-angle geometrical model,† from which the hyperbolic sines and cosines of complex angles can be presented projectively, has been constructed and described.

Brief Bibliography of Tables of Hyperbolic Functions

(1) "Tafeln der Hyperbelfunctionen und der Kreisfunctionen," by Dr. W. Ligowski, Berlin, 1890, Ernst and Korn, 104 pages, giving five-figure logarithms of sinh θ, cosh θ, and tanh θ up to $\theta = 9$, by steps of 0.001 up to $\theta = 2$ and from 2.0 to 9.0 by steps of

* This compendium has, by permission, been included in this book at its second edition, as Table XXIII.

† "A new geometrical model for the orthogonal projection of the cosines and sines of complex angles" by A. E. Kennelly, Proc. Am. Ac. of Arts and Sciences, Vol. 54, April, 1919, pp. 371–378.

0.01; also the Gudermannian angle to two or more decimals of a second of arc, and other tables.

(2) Smithsonian Mathematical Tables, "Hyperbolic Functions," by George F. Becker, and C. E. van Orstrand, Smithsonian Institute, Washington, D.C., 1909, 321 pages, giving five-figure logarithms of sinh θ, cosh θ, and tanh θ, by steps of 0.0001 up to 0.1, by steps of 0.001 from 0.1 to 3.0, and by steps of 0.01 from 3.0 to 6.0; also similar five-figure tables of natural real hyperbolic functions, and various other tables.

(3) "Alternating-Current Phenomena in Parallel Conductors," Vol. I by F. E. Pernot, John Wiley, New York, 1918, containing a Table of six-decimal logarithms of hyperbolic functions, up to 2.0 by steps of 0.001. These present a higher order of precision by one unit, than have been previously available for real hyperbolic functions.

The following is a list of all the tables of Complex Hyperbolic Functions known to the present writer, in the order of date of publication:—

(4) Chrystal's "Algebra," Edinburgh, 1889, briefly discusses the theory of sinh θ, cosh θ, and tanh θ where θ is complex; or of the form $x + iy$. Graphs are given in outline for these functions, from which a few numerical values may be read.

(5) The paper on "Resonance in Alternating-Current Lines," by E. J. Houston and A. E. Kennelly, *Transactions A. I. E. E.*, April, 1895, Vol. XII, pages 133–169, contains a Plate for the graphical evaluation of sinh θ and of cosh θ, θ being a complex variable $x + iq$, between the limits of $x = 0$ and $x = 1.25$; $q = 0$ and $q = \infty$, by steps of 0.05 in x and q. The Plate is 40 cm. × 34 cm. and corresponds to Plates VII—VIIIA of the Atlas prepared from tables in this book, except that it gives the result in regular polar coördinates instead of regular rectangular coördinates. It was produced, by a graphical process, for a precision of the 2.5th order.

(6) The first tables of complex hyperbolic functions were a short set published by Dr. James McMahon in his Chapter IV, entitled "Hyperbolic Functions," of a book by Merriam and Woodward on "Higher Mathematics," pages 107–168. The tables gave sinh $(x + iy)$ and cosh $(x + iy)$ from $x = 0$ to $x = 1.5$, by steps of 0.1, and also from $y = 0$ to $y = 1.5$, by steps of 0.1, Wiley & Sons, New York, 1896. The chapter has since been issued as a separate volume by the same publishers.

(7) A table of hyperbolic functions of semi-imaginaries or sinh, cosh, tanh, coth, sech and cosech of $x \underline{/45^\circ}$, by steps of 0.1 in x up to $x = 20.5$, was published by the present writer in a paper on "The Alternating-Current Theory of Transmission Speed over Submarine Telegraph Cables," in the *Proceedings of The International Electrical Congress of St. Louis*, Section A, Vol. I, pages 68–105, 1904. This table is reproduced in Table VI of this volume.

(8) Some short tables of sinh, cosh, tanh, coth, sech, and cosech $\rho \underline{/\delta}$ by steps of 0.1 in ρ, up to $\rho = 1.5$, for five particular values of δ, published by the present writer in an article on "The Distribution of Pressure and Current over Alternating-Current Circuits," in the *Harvard Engineering Journal*, 1905–06.

(9) Short three-digit tables of sinh and cosh $(x + iy)$ up to $x = 1$, and $y = 1$, by W. E. Miller, in a paper "Formulae, Constants, and Hyperbolic Functions for Transmission-Line Problems" in the *General Electrical Review*, Schenectady, N. Y., May, 1910. Supplement.

(10) "Tables of Hyperbolic Functions in Reference to Long Alternating-Current Transmission Lines," published by the present writer in the *Transactions of the American Institute of Electrical Engineers*, December 1911, pages 2495–2506. These give sinh, cosh, and tanh $\rho \underline{/\delta}$ from $\rho = 0$ to $\rho = 0.5$, by steps of 0.1, and from $\delta = 60°$ to $\delta = 90°$ by steps of 1°. These tables are incorporated in Tables I, II, and III of this volume.

(11) "Tables of Sines, Cosines, Tangents, Cosecants, Secants, and Cotangents of Real and Complex Hyperbolic Angles," published by the present writer in *The Harvard Engineering Journal*," 1912. These gave sinh, cosh, and tanh $\rho \underline{/\delta}$ from $\rho = 0$ to $\rho = 1$ by steps of 0.1, and from $\delta = 45°$ to $\delta = 90°$ by steps of 1°; also corresponding tables of $(\sinh \theta)/\theta$ and of $(\tanh \theta)/\theta$. These tables are published in separate form by the *Harvard Engineering Journal*. They are incorporated in tables I, II, III, IV, and V of this volume.

New Tables introduced in the Second Edition

Tables I to V in this volume were computed for the range of 45° to 90° in the slope or argument δ of the entering vector quantity; because at that time it did not appear that there would be any need for the range from 0° to 45°. Alternating-current lines used for the transmission or distribution of power have linear hyperbolic angles α, the slope of which is commonly between 80° and 90°, rarely falling as low as 45°. It has been shown during recent years, however, that railway-signal engineers employ track-signaling circuits, formed of the rails. These are metallic circuits of low frequency, small linear capacitance and large distributed linear leakance. The linear hyperbolic angles α of such circuits develop slopes lying within the range $\delta = 0°$ to 45°. It has therefore become desirable to cover this range, at least as far as $\rho = 1$. For that purpose, Tables XVII to XXI have been inserted. They run by steps of 0.05 in ρ, from 0 to 1.0, and by steps of 5° in δ, from 0° to 45°. This new tabulated material is available for use in track-signaling and similar computations. It is hoped to incorporate it graphically into the associated Chart Atlas at the first opportunity.

Table XVII presents sinh $\rho \underline{/\delta}$ as a polar planevector. It corresponds to and may be regarded as an extension of Table I. Similarly Tables XVIII, XIX, XX and XXI correspond respectively to Tables II, III, IV and V. Whereas, however, Tables I to V are carried to five decimal places in the sizes and three decimal places in the slopes of the evaluated quantities, the new tables are carried to six decimal places in sizes and four decimal places in slopes. They thus aim at one higher order of precision.*

Table XXII is similar to Table XI and expands the region covered by the first six entries of the latter into a correspondingly magnified field. It has been found that in

* The author desires to express his acknowledgment of the painstaking assistance, on these tables, by Miss Lillian L. Hodgdon, of the Harvard Observatory computing staff.

dealing with short lengths of alternating-current line, having negligible linear inductance as well as negligible linear leakance, and therefore having a semi-imaginary linear angle, there is frequent need for a magnified table of this kind. It may be noted that whereas Table VI expresses slopes in degrees and minutes, Table XXII expresses them as degrees, and four-place decimals of a degree.

Table XXIII is a useful collection of 238 formulas, with a few insertions, taken from Becker and van Orstrand's book of Tables of real hyperbolic functions, referred to in the footnote on page 210.

TABLE XVII. HYPERBOLIC SINES. $\sinh(\rho\,\underline{/\delta}) = r\,\underline{/\gamma}$.

°	0	°	0.05	°	0.10	°
0	0.000000	0.0000	0.050021	0.0000	0.100167	0.0000
5	0.000000	5.0000	0.050020	5.0042	0.100164	5.0167
10	0.000000	10.0000	0.050020	10.0081	0.100157	10.0325
15	0.000000	15.0000	0.050019	15.0119	0.100144	15.0478
20	0.000000	20.0000	0.050016	20.0153	0.100128	20.0614
25	0.000000	25.0000	0.050014	25.0183	0.100107	25.0730
30	0.000000	30.0000	0.050011	30.0208	0.100083	30.0828
35	0.000000	35.0000	0.050006	35.0222	0.100057	35.0897
40	0.000000	40.0000	0.050003	40.0236	0.100029	40.0942
45	0.000000	45.0000	0.05000	45.0236	0.10000	45.0952

°	0.35	°	0.40	°	0.45	°
0	0.357190	0.0000	0.410752	0.0000	0.465342	0.0000
5	0.357081	5.2014	0.410589	5.2625	0.465169	5.3314
10	0.356757	10.3969	0.410105	10.5172	0.464420	10.6531
15	0.356228	15.5808	0.409316	15.7569	0.463294	15.9558
20	0.355512	20.7472	0.408245	20.9742	0.461767	21.2303
25	0.354628	25.8908	0.406925	26.1625	0.459886	26.4686
30	0.353606	31.0089	0.405397	31.3161	0.457709	31.6630
35	0.352475	36.0961	0.403709	36.4305	0.455303	36.8086
40	0.351270	41.1503	0.401910	41.5017	0.452741	41.8997
45	0.35003	46.1694	0.40006	46.5278	0.45010	46.9338

°	0.70	°	0.75	°	0.80	°
0	0.758584	0.0000	0.822317	0.0000	0.888106	0.0000
5	0.757700	5.7875	0.821227	5.9000	0.886780	6.0192
10	0.755078	11.5533	0.817993	11.7753	0.882843	12.0108
15	0.750800	17.2755	0.812719	17.6019	0.876425	17.9481
20	0.745004	22.9344	0.805576	23.3567	0.867734	23.8044
25	0.737873	28.5103	0.796787	29.0175	0.857048	29.5561
30	0.729632	33.9861	0.786636	34.5647	0.844710	35.1800
35	0.720538	39.3467	0.775439	39.9811	0.831105	40.6567
40	0.710872	44.5800	0.763544	45.2525	0.816660	45.9697
45	0.700934	49.6767	0.751317	50.3678	0.801819	51.1064

Examples. $\sinh(0.35\,\underline{/35^\circ}) = 0.352475\,\underline{/36^\circ.0961.}$
$\sinh(0.80\,\underline{/5^\circ}) = 0.886780\,\underline{/6^\circ.0192.}$

°	0.15	°	0.20	°	0.25	°	0.30	°
0	0.150563	0.0000	0.201336	0.0000	0.252612	0.0000	0.304520	0.0000
5	0.150554	5.0372	0.201316	5.0661	0.252573	5.1033	0.304452	5.1483
10	0.150529	10.0733	0.201256	10.1303	0.252455	10.2033	0.304248	10.2922
15	0.150488	15.0172	0.201157	15.1906	0.252263	15.2972	0.303915	15.4275
20	0.150432	20.1380	0.201024	20.2450	0.252002	20.3825	0.303465	20.5500
25	0.150362	25.1644	0.200859	25.2919	0.251680	25.4561	0.302909	25.6558
30	0.150282	30.1858	0.200669	30.3303	0.251308	30.5158	0.302265	30.7419
35	0.150193	35.2017	0.200458	35.3586	0.250896	35.5600	0.301553	35.8058
40	0.150098	40.2114	0.200233	40.3761	0.250457	40.5872	0.300795	40.8456
45	0.15000	45.2146	0.20000	45.3817	0.25001	45.5965	0.30001	45.8592

°	0.50	°	0.55	°	0.60	°	0.65	°
0	0.521095	0.0000	0.578152	0.0000	0.636654	0.0000	0.696748	0.0000
5	0.520776	5.4078	0.577726	5.4919	0.636100	5.5833	0.696042	5.6819
10	0.519829	10.8039	0.576463	10.9697	0.634456	11.1500	0.693947	11.3477
15	0.518282	16.1767	0.574400	16.4197	0.631774	16.6842	0.690530	16.9694
20	0.516184	21.5153	0.571604	21.8286	0.628138	22.1700	0.685898	22.5386
25	0.513601	26.8094	0.568162	27.1844	0.623662	27.5933	0.680199	28.0355
30	0.510612	32.0503	0.564179	32.4764	0.618485	32.9414	0.673609	33.4450
35	0.507309	37.2305	0.559779	37.6956	0.612769	38.2036	0.666335	38.7539
40	0.503794	42.3439	0.555099	42.8344	0.606689	43.3705	0.658601	43.9525
45	0.50017	47.3872	0.550279	47.8880	0.600432	48.4369	0.650644	49.0330

°	0.85	°	0.90	°	0.95	°	1.00	°
0	0.956116	0.0000	1.026517	0.0000	1.099484	0.0000	1.175201	0.0000
5	0.954520	6.1447	1.024615	6.2767	1.097239	6.4147	1.172573	6.5592
10	0.949784	12.2592	1.018975	12.5200	1.090583	12.7928	1.164779	13.0775
15	0.942064	18.3131	1.009783	18.6967	1.079736	19.0986	1.152083	19.5180
20	0.931612	24.2775	0.997344	24.7753	1.065062	25.2969	1.134913	25.8417
25	0.918768	30.1255	0.982060	30.7253	1.047043	31.3544	1.113841	32.0122
30	0.903942	35.8314	0.964429	36.5183	1.026266	37.2400	1.089558	37.9955
35	0.887604	41.3730	0.945011	42.1294	1.003398	42.9253	1.062847	43.7603
40	0.870267	46.7314	0.924414	47.5372	0.979156	48.3864	1.034550	49.2789
45	0.852463	51.8917	0.903276	52.7242	0.954292	53.6033	1.005545	54.5292

Examples. $\sinh(0.90\underline{/20^\circ}) = 0.997344\underline{/24^\circ.7753}$.
$\sinh(1.0\underline{/0^\circ}) = 1.175201\underline{/0^\circ}$.

Table XVIII. HYPERBOLIC COSINES. $\cosh (\rho \underline{/\delta}) = r \underline{/\gamma}$.

	0		0.05		0.10	
°		°		°		°
0	1.000000	0.0000	1.001250	0.0000	1.005004	0.0000
5	1.000000	0.0000	1.001231	0.0125	1.004929	0.0497
10	1.000000	0.0000	1.001175	0.0244	1.004703	0.0978
15	1.000000	0.0000	1.001083	0.0358	1.004335	0.1428
20	1.000000	0.0000	1.000958	0.0461	1.003836	0.1836
25	1.000000	0.0000	1.000804	0.0547	1.003221	0.2189
30	1.000000	0.0000	1.000626	0.0619	1.002507	0.2478
35	1.000000	0.0000	1.000428	0.0672	1.001718	0.2689
40	1.000000	0.0000	1.000218	0.0705	1.000876	0.2820
45	1.000000	0.0000	1.00000	0.0716	1.00001	0.2864

	0.35		0.40		0.45	
°		°		°		°
0	1.061878	0.0000	1.081072	0.0000	1.102970	0.0000
5	1.060965	0.5861	1.079886	0.7567	1.101477	0.9453
10	1.058252	1.1561	1.076361	1.4933	1.097041	1.8669
15	1.053819	1.6950	1.070598	2.1911	1.089786	2.7411
20	1.047791	2.1872	1.062762	2.8303	1.079919	3.5450
25	1.040347	2.6189	1.053079	3.3936	1.067721	4.2567
30	1.031702	2.9772	1.041829	3.8639	1.053539	4.8550
35	1.022112	3.2506	1.029339	4.2264	1.037782	5.3208
40	1.011859	3.4295	1.015974	4.4678	1.020908	5.6375
45	1.00125	3.5071	1.00213	4.5784	1.00341	5.7906

	0.70		0.75		0.80	
°		°		°		°
0	1.255169	0.0000	1.294683	0.0000	1.337435	0.0000
5	1.251669	2.1083	1.290690	2.3744	1.332918	2.6483
10	1.241264	4.1750	1.278820	4.7044	1.319493	5.2500
15	1.224242	6.1581	1.259402	6.9456	1.297535	7.7578
20	1.201069	8.0155	1.232970	9.0520	1.267648	10.1236
25	1.172378	9.7039	1.200241	10.9775	1.230648	12.2978
30	1.138949	11.1803	1.162104	12.6747	1.187536	14.2294
35	1.101690	12.4000	1.119583	14.0942	1.139459	15.8644
40	1.061615	13.3186	1.073820	15.1850	1.087691	17.1458
45	1.019823	13.8911	1.026048	15.8947	1.033602	18.0136

Examples. $\cosh (0.10 \underline{/25^\circ}) = 1.003221 \underline{/0^\circ.2189}$.

$\cosh (0.75 \underline{/40^\circ}) = 1.073820 \underline{/15^\circ.1850}$.

δ°	0.15 r	0.15 γ°	0.20 r	0.20 γ°	0.25 r	0.25 γ°	0.30 r	0.30 γ°
0	1.011271	0.0000	1.020067	0.0000	1.031413	0.0000	1.045339	0.0000
5	1.011101	0.1111	1.019765	0.1964	1.030943	0.3047	1.044665	0.4350
10	1.010595	0.2189	1.018868	0.3872	1.029547	0.6006	1.042663	0.8578
15	1.009769	0.3203	1.017404	0.5664	1.027265	0.8794	1.039390	1.2567
20	1.008648	0.4119	1.015415	0.7292	1.024167	1.1328	1.034944	1.6200
25	1.007265	0.4914	1.012961	0.8703	1.020343	1.3533	1.029455	1.9375
30	1.005662	0.5561	1.010116	0.9858	1.015908	1.5344	1.023084	2.1994
35	1.003887	0.6042	1.006966	1.0719	1.010992	1.6703	1.016021	2.3975
40	1.001995	0.6339	1.003604	1.1258	1.005746	1.7567	1.008476	2.5253
45	1.00005	0.6445	1.00013	1.1458	1.00033	1.7901	1.00068	2.5773

δ°	0.50 r	0.50 γ°	0.55 r	0.55 γ°	0.60 r	0.60 γ°	0.65 r	0.65 γ°
0	1.127626	0.0000	1.155101	0.0000	1.185465	0.0000	1.218793	0.0000
5	1.125794	1.1506	1.152899	1.3711	1.182861	1.6053	1.215756	1.8514
10	1.120349	2.2736	1.146351	2.7108	1.175118	3.1753	1.206728	3.6644
15	1.111445	3.3411	1.135641	3.9872	1.162452	4.6750	1.191956	5.4000
20	1.099330	4.3264	1.121066	5.1694	1.145211	6.0689	1.171848	7.0194
25	1.084345	5.2028	1.103034	6.2267	1.123873	7.3222	1.146955	8.4836
30	1.066914	5.9453	1.082045	7.1292	1.099026	8.4006	1.117959	9.7533
35	1.047534	6.5297	1.058692	7.8481	1.071363	9.2700	1.085656	10.7894
40	1.026760	6.9350	1.033637	8.3566	1.041655	9.8980	1.050938	11.5539
45	1.00520	7.1424	1.007598	8.6311	1.010745	10.2544	1.014773	12.0094

δ°	0.85 r	0.85 γ°	0.90 r	0.90 γ°	0.95 r	0.95 γ°	1.00 r	1.00 γ°
0	1.383531	0.0000	1.433086	0.0000	1.486225	0.0000	1.543081	0.0000
5	1.378460	2.9289	1.427430	3.2150	1.479951	3.5053	1.536155	3.7989
10	1.363390	5.8092	1.410623	6.3794	1.461313	6.9589	1.515588	7.5475
15	1.338746	8.5914	1.383145	9.4428	1.430851	10.3086	1.481987	11.1858
20	1.305212	11.2253	1.345771	12.3525	1.389438	13.5005	1.436333	14.6653
25	1.263709	13.6589	1.299533	15.0545	1.338233	16.4789	1.379926	17.9267
30	1.215358	15.8375	1.245685	17.4914	1.278634	19.1844	1.314321	20.9097
35	1.161440	17.7030	1.185653	19.6019	1.212219	21.5531	1.241261	23.5483
40	1.103367	19.1936	1.120988	21.3192	1.140689	23.5142	1.162611	25.7689
45	1.042645	20.2411	1.053338	22.5686	1.065840	24.9872	1.080307	27.4870

Examples. cosh $(0.25\angle 30^\circ) = 1.015908\angle 1^\circ.5344$.
cosh $(1.00\angle 40^\circ) = 1.162611\angle 25^\circ.7689$.

TABLE XIX. HYPERBOLIC TANGENTS. $\tanh(\rho\,\underline{/\delta}) = r\,\underline{/\gamma}$.

°	0	°	0.05	°	0.10	°
0	0.000000	0.0000	0.049958	0.0000	0.099668	0.0000
5	0.000000	5.0000	0.049959	4.9917	0.099673	4.9670
10	0.000000	10.0000	0.049961	9.9837	0.099688	9.9347
15	0.000000	15.0000	0.049965	14.9761	0.099712	14.9050
20	0.000000	20.0000	0.049968	19.9692	0.099745	19.8778
25	0.000000	25.0000	0.049974	24.9636	0.099786	24.8541
30	0.000000	30.0000	0.049980	29.9589	0.099833	29.8350
35	0.000000	35.0000	0.049985	34.9550	0.099886	34.8208
40	0.000000	40.0000	0.049992	39.9531	0.099941	39.8122
45	0.000000	45.0000	0.05000	44.9520	0.10000	44.8087

°	0.35	°	0.40	°	0.45	°
0	0.336375	0.0000	0.379949	0.0000	0.421899	0.0000
5	0.336562	4.6153	0.380215	4.5058	0.422260	4.3861
10	0.337119	9.2408	0.381011	9.0239	0.423339	8.7862
15	0.338036	13.8858	0.382325	13.5658	0.425124	13.2147
20	0.339296	18.5600	0.384135	18.1439	0.427594	17.6853
25	0.340875	23.2719	0.386414	22.7689	0.430717	22.2119
30	0.342740	28.0317	0.389121	27.4522	0.434449	26.8080
35	0.344849	32.8455	0.392202	32.2041	0.438727	31.4878
40	0.347153	37.7208	0.395591	37.0339	0.443469	36.2622
45	0.34959	42.6623	0.39921	41.9494	0.44857	41.1432

°	0.70	°	0.75	°	0.80	°
0	0.604367	0.0000	0.635150	0.0000	0.664037	0.0000
5	0.605352	3.6792	0.636270	3.5256	0.665292	3.3709
10	0.608313	7.3783	0.639647	7.0709	0.669078	6.7608
15	0.613278	11.1174	0.645321	10.6563	0.675454	10.1903
20	0.620284	14.9189	0.653363	14.3047	0.684523	13.6808
25	0.629382	18.8064	0.663856	18.0400	0.696420	17.2583
30	0.640619	22.8058	0.676907	21.8900	0.711313	20.9506
35	0.654029	26.9467	0.692614	25.8869	0.729386	24.7922
40	0.669614	31.2614	0.711054	30.0675	0.750820	28.8239
45	0.687309	35.7856	0.732244	34.4731	0.775752	33.0928

Examples. $\tanh(0.75\,\underline{/25^\circ}) = 0.663856\,\underline{/18^\circ.0400}$.
$\tanh(0.40\,\underline{/20^\circ}) = 0.384135\,\underline{/18^\circ.1439}$.

°	0.15	°	0.20	°	0.25	°	0.30	°
0	0.148885	0.0000	0.197375	0.0000	0.244919	0.0000	0.291312	0.0000
5	0.148901	4.9261	0.197414	4.8697	0.244992	4.7986	0.291435	4.7133
10	0.148951	9.8544	0.197529	9.7431	0.245210	9.6027	0.291799	9.4344
15	0.149032	14.7869	0.197718	14.6242	0.245567	14.4178	0.292398	14.1708
20	0.149142	19.7261	0.197972	19.5158	0.246055	19.2497	0.293219	18.9300
25	0.149277	24.6730	0.198289	24.4216	0.246663	24.1028	0.294242	23.7183
30	0.149436	29.6297	0.198659	29.3445	0.247373	28.9814	0.295445	28.5425
35	0.149611	34.5975	0.199071	34.2867	0.248168	33.8897	0.296798	33.4083
40	0.149799	39.5775	0.199514	39.2503	0.249027	38.8305	0.298267	38.3203
45	0.14999	44.5701	0.19997	44.2359	0.24993	43.8064	0.29981	43.2819

°	0.50	°	0.55	°	0.60	°	0.65	°
0	0.462117	0.0000	0.500521	0.0000	0.537049	0.0000	0.571669	0.0000
5	0.462586	4.2572	0.501107	4.1208	0.537764	3.9780	0.572518	3.8305
10	0.463988	8.5303	0.502867	8.2589	0.539908	7.9747	0.575065	7.6803
15	0.466314	12.8356	0.505793	12.4325	0.543484	12.0092	0.579325	11.5694
20	0.469545	17.1889	0.509875	16.6592	0.548491	16.1011	0.585313	15.5192
25	0.473651	21.6066	0.515090	20.9577	0.554922	20.2711	0.593047	19.5519
30	0.478587	26.1050	0.521400	25.3472	0.562757	24.5408	0.602535	23.6917
35	0.484289	30.7008	0.528746	29.8475	0.571953	28.9336	0.613763	27.9645
40	0.490664	35.4089	0.537034	34.4778	0.582428	33.4725	0.626679	32.3986
45	0.49759	40.2448	0.546130	39.2569	0.594049	38.1825	0.641172	37.0236

°	0.85	°	0.90	°	0.95	°	1.00	°
0	0.691070	0.0000	0.716298	0.0000	0.739782	0.0000	0.761595	0.0000
5	0.692454	3.2158	0.717804	3.0617	0.741402	2.9094	0.763317	2.7603
10	0.696634	6.4500	0.722358	6.1406	0.746304	5.8339	0.768533	5.5300
15	0.703692	9.7217	0.730063	9.2539	0.754611	8.7900	0.777391	8.3322
20	0.713763	13.0522	0.741095	12.4228	0.766541	11.7964	0.790146	11.1764
25	0.727041	16.4666	0.755702	15.6708	0.782407	14.8755	0.807174	14.0855
30	0.743766	19.9939	0.774215	19.0269	0.802627	18.0556	0.828989	17.0858
35	0.764227	23.6700	0.797038	22.5275	0.827737	21.3722	0.856264	20.2120
40	0.788737	27.5378	0.824642	26.2180	0.858389	24.8722	0.889851	23.5100
45	0.817596	31.6506	0.857537	30.1556	0.895343	28.6161	0.930795	27.0422

Examples. $\tanh (0.25 \underline{/25^\circ}) = 0.246663 \underline{/24^\circ.1028}$.
$\tanh (0.90 \underline{/30^\circ}) = 0.774215 \underline{/19^\circ.0269}$.

Table XX. CORRECTING FACTOR. $\dfrac{\sinh \theta}{\theta} = r \underline{/ \gamma}$.

	0		0.05		0.10	
°		°		°		°
0	1.000000	0.0000	1.000420	0.0000	1.001670	0.0000
5	1.000000	0.0000	1.000404	0.0042	1.001638	0.0167
10	1.000000	0.0000	1.000398	0.0081	1.001570	0.0325
15	1.000000	0.0000	1.000373	0.0119	1.001442	0.0478
20	1.000000	0.0000	1.000317	0.0153	1.001279	0.0614
25	1.000000	0.0000	1.000279	0.0183	1.001071	0.0730
30	1.000000	0.0000	1.000216	0.0208	1.000834	0.0828
35	1.000000	0.0000	1.000134	0.0222	1.000571	0.0897
40	1.000000	0.0000	1.000061	0.0236	1.000290	0.0942
45	1.000000	0.0000	1.00000	0.0236	1.00000	0.0952

	0.35		0.40		0.45	
°		°		°		°
0	1.020543	0.0000	1.026880	0.0000	1.034093	0.0000
5	1.020230	0.2014	1.026473	0.2625	1.033577	0.3314
10	1.019305	0.3969	1.025264	0.5172	1.032044	0.6531
15	1.017796	0.5808	1.023290	0.7569	1.029542	0.9558
20	1.015748	0.7472	1.020612	0.9742	1.026148	1.2303
25	1.013224	0.8908	1.017312	1.1625	1.021969	1.4686
30	1.010302	1.0089	1.013493	1.3161	1.017131	1.6630
35	1.007070	1.0961	1.009272	1.4305	1.011784	1.8086
40	1.003630	1.1503	1.004775	1.5017	1.006092	1.8997
45	1.00008	1.1694	1.00014	1.5278	1.00023	1.9338

	0.70		0.75		0.80	
°		°		°		°
0	1.083691	0.0000	1.096423	0.0000	1.110132	0.0000
5	1.082429	0.7875	1.094969	0.9000	1.108475	1.0192
10	1.078682	1.5533	1.090658	1.7753	1.103554	2.0108
15	1.072572	2.2755	1.083625	2.6019	1.095532	2.9481
20	1.064292	2.9344	1.074102	3.3567	1.084668	3.8044
25	1.054105	3.5103	1.062383	4.0175	1.071311	4.5561
30	1.042331	3.9861	1.048848	4.5647	1.055881	5.1800
35	1.029340	4.3467	1.033919	4.9811	1.038881	5.6567
40	1.015532	4.5800	1.018059	5.2525	1.020825	5.9697
45	1.001334	4.6767	1.001756	5.3678	1.002274	6.1064

Example. $\dfrac{\sinh (0.40 \underline{/25^\circ})}{0.40 \underline{/25^\circ}} = 1.017312 \underline{/1^\circ.1625}$.

TABLE XX. CORRECTING FACTOR. $\frac{\sinh \theta}{\theta} = r \angle \gamma.$ CONTINUED

	0.15	°	0.20	°	0.25	°	0.30	°
0	1.003753	0.0000	1.006680	0.0000	1.010448	0.0000	1.015067	0.0000
5	1.003696	0.0372	1.006579	0.0661	1.010291	0.1033	1.014839	0.1483
10	1.003527	0.0733	1.006278	0.1303	1.009820	0.2033	1.014161	0.2922
15	1.003253	0.0172	1.005784	0.1906	1.009051	0.2972	1.013051	0.4275
20	1.002878	0.1380	1.005119	0.2450	1.008007	0.3825	1.011549	0.5500
25	1.002412	0.1644	1.004296	0.2919	1.006722	0.4561	1.009696	0.6558
30	1.001878	0.1858	1.003343	0.3303	1.005233	0.5158	1.007550	0.7419
35	1.001287	0.2017	1.002290	0.3586	1.003584	0.5600	1.005177	0.8058
40	1.000653	0.2114	1.001167	0.3761	1.001830	0.5872	1.002651	0.8456
45	1.00000	0.2146	1.00001	0.3817	1.00003	0.5965	1.00005	0.8592

	0.50	°	0.55	°	0.60	°	0.65	°
0	1.042190	0.0000	1.051185	0.0000	1.061090	0.0000	1.071920	0.0000
5	1.041552	0.4078	1.050411	0.4919	1.060167	0.5833	1.070833	0.6819
10	1.039657	0.8039	1.048114	0.9697	1.057426	1.1500	1.067611	1.3477
15	1.036564	1.1767	1.044363	1.4197	1.052956	1.6842	1.062354	1.9694
20	1.032369	1.5153	1.039280	1.8286	1.046896	2.1700	1.055228	2.5386
25	1.027202	1.8094	1.033021	2.1844	1.039436	2.5933	1.046459	3.0355
30	1.021223	2.0503	1.025779	2.4764	1.030808	2.9414	1.036322	3.4450
35	1.014618	2.2305	1.017780	2.6956	1.021281	3.2036	1.025131	3.7539
40	1.007587	2.3439	1.009270	2.8344	1.011148	3.3705	1.013232	3.9525
45	1.00035	2.3872	1.000508	2.8880	1.000720	3.4369	1.000991	4.0330

	0.85	°	0.90	°	0.95	°	1.00	°
0	1.124842	0.0000	1.140574	0.0000	1.157352	0.0000	1.175201	0.0000
5	1.122964	1.1447	1.138461	1.2767	1.154989	1.4147	1.172573	1.5592
10	1.117393	2.2592	1.132194	2.5200	1.147982	2.7928	1.164779	3.0775
15	1.108311	3.3131	1.121981	3.6967	1.136564	4.0986	1.152083	4.5180
20	1.096014	4.2775	1.108160	4.7753	1.121117	5.2969	1.134913	5.8417
25	1.080904	5.1255	1.091177	5.7253	1.102151	6.3544	1.113841	7.0122
30	1.063461	5.8314	1.071587	6.5183	1.080280	7.2400	1.089558	7.9955
35	1.044241	6.3730	1.050012	7.1294	1.056208	7.9253	1.062847	8.7603
40	1.023843	6.7314	1.027127	7.5372	1.030691	8.3864	1.034550	9.2789
45	1.002897	6.8917	1.003640	7.7242	1.004518	8.6033	1.005545	9.5292

Example. $\frac{\sinh (0.95 \angle 25^\circ)}{0.95 \angle 25^\circ} = 1.102151 \angle 6^\circ.3544.$

TABLE XXI. CORRECTING FACTOR. $\frac{\tanh \theta}{\theta} = r \angle \gamma$.

°	0	°	0.05	°	0.10	°
0	1.000000	0.0000	0.999160	0.0000	0.996680	0.0000
5	1.000000	0.0000	0.999177	0.0083	0.996732	0.0330
10	1.000000	0.0000	0.999223	0.0163	0.996882	0.0653
15	1.000000	0.0000	0.999291	0.0239	0.997119	0.0950
20	1.000000	0.0000	0.999359	0.0308	0.997448	0.1222
25	1.000000	0.0000	0.999475	0.0364	0.997858	0.1459
30	1.000000	0.0000	0.999591	0.0411	0.998331	0.1650
35	1.000000	0.0000	0.999707	0.0450	0.998856	0.1792
40	1.000000	0.0000	0.999844	0.0469	0.999414	0.1878
45	1.000000	0.0000	1.00000	0.0480	0.99999	0.1913

°	0.35	°	0.40	°	0.45	°
0	0.961071	0.0000	0.949872	0.0000	0.937553	0.0000
5	0.961606	0.3847	0.950538	0.4942	0.938355	0.6139
10	0.963197	0.7592	0.952528	0.9761	0.940753	1.2138
15	0.965817	1.1142	0.955812	1.4342	0.944719	1.7853
20	0.969419	1.4400	0.960338	1.8561	0.950209	2.3147
25	0.973929	1.7281	0.966036	2.2311	0.957150	2.7881
30	0.979258	1.9683	0.972801	2.5478	0.965442	3.1920
35	0.985284	2.1545	0.980505	2.7959	0.974949	3.5122
40	0.991867	2.2792	0.988977	2.9661	0.985487	3.7378
45	0.99883	2.3377	0.99800	3.0506	0.99684	3.8568

°	0.70	°	0.75	°	0.80	°
0	0.863381	0.0000	0.846867	0.0000	0.830046	0.0000
5	0.864789	1.3208	0.848360	1.4744	0.831615	1.6291
10	0.869019	2.6217	0.852862	2.9291	0.836347	3.2392
15	0.876111	3.8826	0.860428	4.3437	0.844318	4.8097
20	0.886121	5.0811	0.871150	5.6953	0.855654	6.3192
25	0.899117	6.1936	0.885142	6.9600	0.870525	7.7417
30	0.915169	7.1942	0.902542	8.1100	0.889141	9.0494
35	0.934328	8.0533	0.923485	9.1131	0.911732	10.2078
40	0.956592	8.7386	0.948072	9.9325	0.938525	11.1761
45	0.981870	9.2144	0.976325	10.5269	0.969690	11.9072

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh (0.75 \angle 25^\circ)}{0.75 \angle 25^\circ} = 0.885142 \overline{\backslash 6^\circ.9600.}$

	0.15		0.20		0.25		0.30	
°		°		°		°		°
0	0.992567	**0.0000**	0.986875	**0.0000**	0.979676	**0.0000**	0.971040	**0.0000**
5	0.992676	**0.0739**	0.987069	**0.1303**	0.979968	**0.2014**	0.971449	**0.2867**
10	0.993006	**0.1456**	0.987642	**0.2569**	0.980839	**0.3973**	0.972665	**0.5656**
15	0.993547	**0.2131**	0.988588	**0.3758**	0.982269	**0.5822**	0.974660	**0.8292**
20	0.994280	**0.2739**	0.989860	**0.4842**	0.984222	**0.7503**	0.977396	**1.0700**
25	0.995182	**0.3270**	0.991446	**0.5784**	0.986650	**0.8972**	0.980807	**1.2817**
30	0.996237	**0.3703**	0.993295	**0.6555**	0.989493	**1.0186**	0.984817	**1.4575**
35	0.997410	**0.4025**	0.995357	**0.7133**	0.992673	**1.1103**	0.989327	**1.5917**
40	0.998660	**0.4225**	0.997571	**0.7497**	0.996106	**1.1695**	0.994224	**1.6797**
45	0.99995	**0.4299**	0.99987	**0.7641**	0.99971	**1.1936**	0.99937	**1.7181**

	0.50		0.55		0.60		0.65	
°		°		°		°		°
0	0.924234	**0.0000**	0.910038	**0.0000**	0.895082	**0.0000**	0.879491	**0.0000**
5	0.925172	**0.7428**	0.911104	**0.8792**	0.896274	**1.0220**	0.880796	**1.1695**
10	0.927976	**1.4697**	0.914304	**1.7411**	0.899847	**2.0253**	0.884716	**2.3197**
15	0.932627	**2.1644**	0.919624	**2.5675**	0.905806	**2.9908**	0.891269	**3.4306**
20	0.939089	**2.8111**	0.927046	**3.3408**	0.914151	**3.8989**	0.900482	**4.4808**
25	0.947302	**3.3934**	0.936527	**4.0423**	0.924870	**4.2289**	0.912380	**5.4481**
30	0.957174	**3.8950**	0.948001	**4.6528**	0.937928	**5.4592**	0.926976	**6.3083**
35	0.968577	**4.2992**	0.961356	**5.1525**	0.953254	**6.0664**	0.944250	**7.0355**
40	0.981327	**4.5911**	0.976426	**5.5222**	0.970713	**6.5275**	0.964122	**7.6014**
45	0.99516	**4.7552**	0.992963	**5.7431**	0.990081	**6.8175**	0.986419	**7.9764**

	0.85		0.90		0.95		1.00	
°		°		°		°		°
0	0.813024	**0.0000**	0.795887	**0.0000**	0.778718	**0.0000**	0.761595	**0.0000**
5	0.814651	**1.7842**	0.797560	**1.9383**	0.780424	**2.0906**	0.763317	**2.2397**
10	0.819569	**3.5500**	0.802620	**3.8594**	0.785583	**4.1661**	0.768533	**4.4700**
15	0.827873	**5.2783**	0.811181	**5.7461**	0.794327	**6.2100**	0.777391	**6.6678**
20	0.839722	**6.9478**	0.823438	**7.5772**	0.806886	**8.2036**	0.790146	**8.8236**
25	0.855342	**8.5334**	0.839669	**9.3292**	0.823586	**10.1245**	0.807174	**10.9145**
30	0.875019	**10.0061**	0.860239	**10.9731**	0.844870	**11.9444**	0.828989	**12.9142**
35	0.899091	**11.3300**	0.885598	**12.4725**	0.871302	**13.6278**	0.856264	**14.7880**
40	0.927926	**12.4622**	0.916269	**13.7820**	0.903567	**15.1278**	0.889851	**16.4900**
45	0.961877	**13.3494**	0.952819	**14.8444**	0.942466	**16.3839**	0.930795	**17.9578**

Note. Negative quantities are in heavy type.

Example. $\frac{\tanh (1.0 \underline{/10^\circ})}{1.0 \underline{/10^\circ}} = 0.768533 \overline{\backslash 4^\circ.4700}$.

Table XXII. FUNCTIONS OF SEMI-IMAGINARIES

Complex Variable $\theta \angle 45^\circ$ (slope constant).

θ hyp. rads.	Sinh $\theta \angle 45^\circ$ Size numeric	Slope degrees	Cosh $\theta \angle 45^\circ$ Size numeric	Slope degrees	tanh $\theta \angle 45^\circ$ Size numeric	Slope degrees	Cosech $\theta \angle 45^\circ$ Size numeric	Slope degrees
0.00	0.00000	45.0000	1.00000	0.0000	0.00000	45.0000	∝	**45.0000**
0.01	0.01000	45.0009	1.00000	0.0028	0.01000	44.9981	100.00000	**45.0009**
0.02	0.02000	45.0037	1.00000	0.0114	0.02000	44.9923	50.00000	**45.0037**
0.03	0.03000	45.0084	1.00000	0.0257	0.03000	44.9827	33.33333	**45.0084**
0.04	0.04000	45.0151	1.00000	0.0458	0.04000	44.9693	25.00000	**45.0151**
0.05	0.05000	45.0236	1.00000	0.0716	0.05000	44.9520	20.00000	**45.0236**
0.06	0.06000	45.0342	1.00000	0.1031	0.06000	44.9310	16.66667	**45.0342**
0.07	0.07000	45.0465	1.00000	0.1403	0.07000	44.9062	14.28571	**45.0465**
0.08	0.08000	45.0608	1.00000	0.1833	0.08000	44.8775	12.50000	**45.0608**
0.09	0.09000	45.0770	1.00001	0.2320	0.09000	44.8450	11.11111	**45.0770**
0.10	0.10000	45.0952	1.00001	0.2864	0.10000	44.8087	10.00000	**45.0952**
0.11	0.11000	45.1152	1.00001	0.3466	0.11000	44.7686	9.09091	**45.1152**
0.12	0.12000	45.1372	1.00002	0.4125	0.12000	44.7247	8.33333	**45.1372**
0.13	0.13000	45.1611	1.00003	0.4841	0.13000	44.6770	7.69231	**45.1611**
0.14	0.14000	45.1869	1.00004	0.5614	0.13999	44.6255	7.14286	**45.1869**
0.15	0.15000	45.2146	1.00005	0.6445	0.14999	44.5701	6.66667	**45.2146**
0.16	0.16000	45.2442	1.00006	0.7333	0.15999	44.5109	6.25000	**45.2442**
0.17	0.17000	45.2757	1.00008	0.8278	0.16999	44.4479	5.88235	**45.2757**
0.18	0.18000	45.3092	1.00009	0.9281	0.17998	44.3811	5.55556	**45.3092**
0.19	0.19000	45.3445	1.00011	1.0341	0.18998	44.3104	5.26316	**45.3445**
0.20	0.20000	45.3817	1.00013	1.1458	0.19997	44.2359	5.00000	**45.3817**
0.21	0.21000	45.4208	1.00016	1.2632	0.20997	44.1576	4.76190	**45.4208**
0.22	0.22000	45.4619	1.00020	1.3864	0.21996	44.0755	4.54545	**45.4619**
0.23	0.23000	45.5048	1.00024	1.5152	0.22995	43.9896	4.34783	**45.5048**
0.24	0.24000	45.5497	1.00028	1.6498	0.23994	43.8999	4.16667	**45.5497**
0.25	0.25001	45.5965	1.00033	1.7901	0.24993	43.8064	3.99984	**45.5965**
0.26	0.26001	45.6453	1.00038	1.9361	0.25991	43.7092	3.84601	**45.6453**
0.27	0.27001	45.6959	1.00044	2.0878	0.26989	43.6081	3.70357	**45.6959**
0.28	0.28001	45.7485	1.00051	2.2452	0.27987	43.5032	3.57130	**45.7485**
0.29	0.29001	45.8029	1.00060	2.4084	0.28984	43.3945	3.44816	**45.8029**
0.30	0.30001	45.8592	1.00068	2.5773	0.29981	43.2819	3.33322	**45.8592**
0.31	0.31002	45.9174	1.00077	2.7520	0.30978	43.1654	3.22560	**45.9174**
0.32	0.32002	45.9775	1.00087	2.9323	0.31974	43.0452	3.12481	**45.9775**
0.33	0.33002	46.0396	1.00098	3.1183	0.32970	42.9213	3.03012	**46.0396**
0.34	0.34002	46.1036	1.00111	3.3099	0.33965	42.7937	2.94100	**46.1036**
0.35	0.35003	46.1694	1.00125	3.5071	0.34959	42.6623	2.85690	**46.1694**
0.36	0.36003	46.2372	1.00140	3.7100	0.35953	42.5272	2.77755	**46.2372**
0.37	0.37004	46.3069	1.00156	3.9185	0.36946	42.3884	2.70241	**46.3069**
0.38	0.38004	46.3786	1.00174	4.1328	0.37939	42.2458	2.63130	**46.3786**
0.39	0.39005	46.4522	1.00193	4.3528	0.38930	42.0994	2.56377	**46.4522**
0.40	0.40006	46.5278	1.00213	4.5784	0.39921	41.9494	2.49963	**46.5278**
0.41	0.41006	46.6053	1.00235	4.8096	0.40910	41.7957	2.43867	**46.6053**
0.42	0.42007	46.6846	1.00259	5.0464	0.41899	41.6382	2.38056	**46.6846**
0.43	0.43008	46.7658	1.00285	5.2889	0.42886	41.4778	2.32515	**46.7658**
0.44	0.44009	46.8489	1.00312	5.5369	0.43872	41.3120	2.27226	**46.8489**
0.45	0.45010	46.9338	1.00341	5.7906	0.44857	41.1432	2.22173	**46.9338**
0.46	0.46012	47.0206	1.00372	6.0498	0.45841	40.9708	2.17335	**47.0206**
0.47	0.47013	47.1093	1.00406	6.3146	0.46823	40.7947	2.12707	**47.1093**
0.48	0.48014	47.2000	1.00442	6.5850	0.47803	40.6150	2.08273	**47.2000**
0.49	0.49016	47.2926	1.00480	6.8609	0.48782	40.4317	2.04015	**47.2926**
0.50	0.50017	47.3872	1.00520	7.1424	0.49759	40.2448	1.99932	**47.3872**

Note. Negative quantities are in heavy type.

Examples. $\sinh 0.13 \angle 45^\circ = 0.13000 \angle 45^\circ.1611.$
$\cosh 0.26 \angle 45^\circ = 1.00038 \angle 1.^\circ 9361.$

Table XXII. FUNCTIONS OF SEMI-IMAGINARIES. Continued

Complex Variable $\theta \angle 45^\circ$ (slope constant).

θ hyp. rads.	Sech $\theta \angle 45^\circ$ Size numeric	Sech $\theta \angle 45^\circ$ Slope degrees	Coth $\theta \angle 45^\circ$ Size numeric	Coth $\theta \angle 45^\circ$ Slope degrees	Sinh $\theta \angle 45^\circ$ / $\theta \angle 45^\circ$ Size numeric	Sinh $\theta \angle 45^\circ$ / $\theta \angle 45^\circ$ Slope degrees	tanh $\theta \angle 45^\circ$ / $\theta \angle 45^\circ$ Size numeric	tanh $\theta \angle 45^\circ$ / $\theta \angle 45^\circ$ Slope degrees
0.00	1.00000	0.0000	∞	45.0000	1.00000	0.0000	1.00000	0.0000
0.01	1.00000	0.0028	100.00000	44.9981	1.00000	0.0009	1.00000	0.0019
0.02	1.00000	0.0114	50.00000	44.9923	1.00000	0.0037	1.00000	0.0077
0.03	1.00000	0.0257	33.33333	44.9827	1.00000	0.0084	1.00000	0.0173
0.04	1.00000	0.0458	25.00000	44.9693	1.00000	0.0151	1.00000	0.0307
0.05	1.00000	0.0716	20.00000	44.9520	1.00000	0.0236	1.00000	0.0480
0.06	1.00000	0.1031	16.66667	44.9310	1.00000	0.0342	1.00000	0.0690
0.07	1.00000	0.1403	14.28571	44.9062	1.00000	0.0465	0.99999	0.0938
0.08	1.00000	0.1833	12.50000	44.8775	1.00000	0.0608	0.99999	0.1225
0.09	0.99999	0.2320	11.11111	44.8450	1.00000	0.0770	0.99999	0.1550
0.10	0.99999	0.2864	10.00000	44.8087	1.00000	0.0952	0.99999	0.1913
0.11	0.99999	0.3466	9.09091	44.7686	1.00000	0.1152	0.99998	0.2314
0.12	0.99998	0.4125	8.33333	44.7247	1.00000	0.1372	0.99998	0.2753
0.13	0.99997	0.4841	7.69231	44.6770	1.00000	0.1611	0.99997	0.3230
0.14	0.99996	0.5614	7.14337	44.6255	1.00000	0.1869	0.99996	0.3745
0.15	0.99995	0.6445	6.66712	44.5701	1.00000	0.2146	0.99995	0.4299
0.16	0.99994	0.7333	6.25039	44.5109	1.00000	0.2442	0.99994	0.4891
0.17	0.99992	0.8278	5.88271	44.4479	1.00001	0.2757	0.99992	0.5521
0.18	0.99991	0.9281	5.55618	44.3811	1.00001	0.3092	0.99991	0.6189
0.19	0.99989	1.0341	5.26371	44.3104	1.00001	0.3445	0.99989	0.6896
0.20	0.99987	1.1458	5.00050	44.2359	1.00001	0.3817	0.99987	0.7641
0.21	0.99984	1.2632	4.76258	44.1576	1.00002	0.4208	0.99984	0.8424
0.22	0.99980	1.3864	4.54628	44.0755	1.00002	0.4619	0.99981	0.9245
0.23	0.99976	1.5152	4.34878	43.9896	1.00002	0.5048	0.99978	1.0104
0.24	0.99972	1.6498	4.16771	43.8999	1.00002	0.5497	0.99975	1.1001
0.25	0.99967	1.7901	4.00112	43.8064	1.00003	0.5965	0.99971	1.1936
0.26	0.99962	1.9361	3.84748	43.7092	1.00003	0.6453	0.99966	1.2908
0.27	0.99956	2.0878	3.70521	43.6081	1.00003	0.6959	0.99960	1.3919
0.28	0.99949	2.2452	3.57309	43.5032	1.00004	0.7485	0.99953	1.4968
0.29	0.99940	2.4084	3.45018	43.3945	1.00004	0.8029	0.99945	1.6055
0.30	0.99932	2.5773	3.33544	43.2819	1.00005	0.8592	0.99937	1.7181
0.31	0.99923	2.7520	3.22810	43.1654	1.00005	0.9174	0.99928	1.8346
0.32	0.99913	2.9323	3.12754	43.0452	1.00006	0.9775	0.99919	1.9548
0.33	0.99902	3.1183	3.03305	42.9213	1.00006	1.0396	0.99908	2.0787
0.34	0.99889	3.3099	2.94421	42.7937	1.00007	1.1036	0.99896	2.2063
0.35	0.99875	3.5071	2.86049	42.6623	1.00008	1.1694	0.99883	2.3377
0.36	0.99860	3.7100	2.78141	42.5272	1.00009	1.2372	0.99869	2.4728
0.37	0.99844	3.9185	2.70665	42.3884	1.00010	1.3069	0.99854	2.6116
0.38	0.99826	4.1328	2.63580	42.2458	1.00011	1.3786	0.99837	2.7542
0.39	0.99807	4.3528	2.56870	42.0994	1.00013	1.4522	0.99819	2.9006
0.40	0.99788	4.5784	2.50494	42.9494	1.00014	1.5278	0.99800	3.0506
0.41	0.99766	4.8096	2.44438	41.7957	1.00016	1.6053	0.99780	3.2043
0.42	0.99742	5.0464	2.38668	41.6382	1.00017	1.6846	0.99759	3.3618
0.43	0.99716	5.2889	2.33174	41.4778	1.00019	1.7658	0.99736	3.5230
0.44	0.99689	5.5369	2.27935	41.3120	1.00021	1.8489	0.99711	3.6880
0.45	0.99660	5.7906	2.22930	41.1432	1.00023	1.9338	0.99684	3.8568
0.46	0.99629	6.0498	2.18145	40.9708	1.00025	2.0206	0.99655	4.0292
0.47	0.99596	6.3146	2.13571	40.7947	1.00027	2.1093	0.99624	4.2053
0.48	0.99560	6.5850	2.09190	40.6150	1.00030	2.2000	0.99591	4.3850
0.49	0.99522	6.8609	2.04995	40.4317	1.00032	2.2926	0.99555	4.5683
0.50	0.99483	7.1424	2.00969	40.2448	1.00035	2.3872	0.99516	4.7552

Note. Negative quantities are in heavy type.

Examples. $\dfrac{\tanh 0.39 \angle 45^\circ}{0.39 \angle 45^\circ} = 0.99819 \,\overline{\backslash 2^\circ.9006.}$

$\coth 0.50 \angle 45^\circ = 2.00969 \,\overline{\backslash 40^\circ.2448.}$

TABLE XXIII. HYPERBOLIC FUNCTION FORMULAS

(from Smithsonian Mathematical Tables No. 1871 of 1909, Becker and van Orstrand's "Hyperbolic Functions," by permission.)

A. Relations between Hyperbolic and Circular Functions

1. $\sinh u = - i \sin iu = \tan gd\, u.$

2. $\cosh u = \cos iu = \sec gd\, u.$

3. $\tanh u = - i \tan iu = \sin gd\, u.$

4. $\tanh \frac{1}{2} u = \tan \frac{1}{2} gd\, u.$

5. $e^u = (1 + \sin gd\, u) \div \cos gd\, u,$
$= [1 - \cos (\frac{1}{2}\pi + gd\, u)] \div \sin (\frac{1}{2}\pi + gd\, u),$
$= \tan (\frac{1}{4}\pi + \frac{1}{2} gd\, u).$

6. $\sinh iu = i \sin u.$

7. $\cosh iu = \cos u.$

8. $\tanh iu = i \tan u.$

8a. $\sin u = - i \sinh iu = \tanh (gd^{-1} u).$

8b. $\cos u = \cosh iu = \text{sech} (\text{gd}^{-1} u).$

8c. $\tan u = - i \tanh iu = \sinh (gd^{-1} u).$

9. $\sinh (u \pm iv) = \pm i \sin (v \mp iu),$
$= \sinh u \cos v \pm i \cosh u \sin v.$

10. $\cosh (u \pm iv) = \cos (v \mp iu),$
$= \cosh u \cos v \pm i \sinh u \sin v.$

10a. $\sin (u \pm iv) = \pm i \sinh (v \pm iu) = \sin u \cosh v \pm i \cos u \sinh v.$

10b. $\cos (u \pm iv) = \cosh (v \mp iu) = \cos u \cosh v \mp i \sin u \sinh v.$

11. $\cosh (mi\pi) = \cos m\pi.$ (m is an integer.)

12. $\sinh (2m + 1) \frac{1}{2} i\pi = i \sin (2m + 1) \frac{1}{2}\pi.$ (m is an integer.)

B. Relations among the Hyperbolic Functions

13. $\sinh u = \frac{1}{2}(e^u - e^{-u}) = - \sinh (- u) = (\text{csch}\, u)^{-1},$
$= 2 \tanh \frac{1}{2} u \div (1 - \tanh^2 \frac{1}{2} u) = \tanh u \div (1 - \tanh^2 u)^{\frac{1}{2}}.$

14. $\cosh u = \frac{1}{2}(e^u + e^{-u}) = \cosh (- u) = (\text{sech}\, u)^{-1},$
$= (1 + \tanh^2 \frac{1}{2} u) \div (1 - \tanh^2 \frac{1}{2} u) = 1 \div (1 - \tanh^2 u)^{\frac{1}{2}}.$

15. $\tanh u = (e^u - e^{-u}) \div (e^u + e^{-u}) = - \tanh (- u),$
$= (\coth u)^{-1} = \sinh u \div \cosh u = (1 - \text{sech}^2 u)^{\frac{1}{2}}.$

16. $\text{sech}\, u = \text{sech} (- u) = (1 - \tanh^2 u)^{\frac{1}{2}}.$

17. $\operatorname{csch} u = -\operatorname{csch}(-u) = (\coth^2 u - 1)^{\frac{1}{2}}$.

18. $\coth u = -\coth(-u) = (\operatorname{csch}^2 u + 1)^{\frac{1}{2}}$.

19. $\cosh^2 u - \sinh^2 u = 1$.

20. $\sinh \frac{1}{2} u = \sqrt{\frac{1}{2}(\cosh u - 1)}$.

21. $\cosh \frac{1}{2} u = \sqrt{\frac{1}{2}(\cosh u + 1)}$.

22. $\tanh \frac{1}{2} u = (\cosh u - 1) \div \sinh u,$
$= \sinh u \div (1 + \cosh u) = \sqrt{(\cosh u - 1) \div (\cosh u + 1)}$.

23. $\sinh 2u = 2 \sinh u \cosh u = 2 \tanh u \div (1 - \tanh^2 u)$.

24. $\cosh 2u = \cosh^2 u + \sinh^2 u = 2 \cosh^2 u - 1,$
$= 1 + 2 \sinh^2 u = (1 + \tanh^2 u) \div (1 - \tanh^2 u)$.

25. $\tanh 2u = 2 \tanh u \div (1 + \tanh^2 u)$.

26. $\sinh 3u = 3 \sinh u + 4 \sinh^3 u$.

27. $\cosh 3u = 4 \cosh^3 u - 3 \cosh u$.

28. $\tanh 3u = (3 \tanh u + \tanh^3 u) \div (1 + 3 \tanh^2 u)$.

28a. $m \cosh u + n \sinh u = \frac{1}{2}(m + n) e^u + \frac{1}{2}(m - n) e^{-u}$.

28b. $m e^u \pm n e^{-u} = (m \pm n) \cosh u + (m \mp n) \sinh u$.

29. $\sinh nu =$

$$n \cosh^{n-1} u \sinh u + \frac{(n)(n-1)(n-2)}{6} \cosh^{n-3} u \sinh^3 u + \ldots .$$

30. $\cosh nu = \cosh^n u + \frac{n(n-1)}{2} \cosh^{n-2} u \sinh^2 u + \ldots .$

31. $\sinh u + \sinh v = 2 \sinh \frac{1}{2}(u + v) \cosh \frac{1}{2}(u - v)$.

32. $\sinh u - \sinh v = 2 \cosh \frac{1}{2}(u + v) \sinh \frac{1}{2}(u - v)$.

33. $\cosh u + \cosh v = 2 \cosh \frac{1}{2}(u + v) \cosh \frac{1}{2}(u - v)$.

34. $\cosh u - \cosh v = 2 \sinh \frac{1}{2}(u + v) \sinh \frac{1}{2}(u - v)$.

35. $\sinh u + \cosh u = (1 + \tanh \frac{1}{2} u) \div (1 - \tanh \frac{1}{2} u)$.

36. $(\sinh u + \cosh u)^n = \cosh nu + \sinh nu$.

36a. $a \sinh u + b \cosh u = \sqrt{a^2 - b^2} \sinh (u + \tanh^{-1} \frac{b}{a})$. $a > b$
$= \sqrt{b^2 - a^2} \cosh (u + \coth^{-1} \frac{b}{a})$. $b > a$

36b. $a \cosh u \pm b \sinh u = \sqrt{a^2 - b^2} \cosh (u \pm \tanh^{-1} \frac{b}{a})$.

37. $\tanh u + \tanh v = \sinh (u + v) \div \cosh u \cosh v$.

38. $\tanh u - \tanh v = \sinh (u - v) \div \cosh u \cosh v$.

39. $\coth u + \coth v = \sinh (u + v) \div \sinh u \sinh v$.

40. $\coth u - \coth v = -\sinh(u - v) \div \sinh u \sinh v.$

41. $\sinh(u \pm v) = \sinh u \cosh v \pm \cosh u \sinh v.$

42. $\cosh(u \pm v) = \cosh u \cosh v \pm \sinh u \sinh v.$

43. $\tanh(u \pm v) = (\tanh u \pm \tanh v) \div (1 \pm \tanh u \tanh v).$

44. $\coth(u \pm v) = (\coth u \coth v \pm 1) \div (\coth v \pm \coth u).$

45. $\sinh(u + v) + \sinh(u - v) = 2 \sinh u \cosh v.$

46. $\sinh(u + v) - \sinh(u - v) = 2 \cosh u \sinh v.$

47. $\cosh(u + v) + \cosh(u - v) = 2 \cosh u \cosh v.$

48. $\cosh(u + v) - \cosh(u - v) = 2 \sinh u \sinh v.$

49. $\tanh \frac{1}{2}(u + v) = (\sinh u + \sinh v) \div (\cosh u + \cosh v).$

50. $\tanh \frac{1}{2}(u - v) = (\sinh u - \sinh v) \div (\cosh u + \cosh v).$

51. $\coth \frac{1}{2}(u + v) = (\sinh u - \sinh v) \div (\cosh u - \cosh v).$

52. $\coth \frac{1}{2}(u - v) = (\sinh u + \sinh v) \div (\cosh u - \cosh v).$

53. $$\frac{\tanh u + \tanh v}{\tanh u - \tanh v} = \frac{\sinh(u + v)}{\sinh(u - v)}.$$

54. $$\frac{\coth u + \coth v}{\coth u - \coth v} = -\frac{\sinh(u + v)}{\sinh(u - v)}.$$

55. $\sinh(u + v) + \cosh(u + v) = (\cosh u + \sinh u)(\cosh v + \sinh v).$

56. $$\sinh(u + v)\sinh(u - v) = \sinh^2 u - \sinh^2 v, \\ = \cosh^2 u - \cosh^2 v.$$

57. $$\cosh(u + v)\cosh(u - v) = \cosh^2 u + \sinh^2 v, \\ = \sinh^2 u + \cosh^2 v.$$

58. $\sinh(mi\pi) = 0.$ (m is an integer.)

59. $\cosh(mi\pi) = (-1)^m.$

60. $\tanh(mi\pi) = 0.$

61. $\sinh(u + mi\pi) = (-1)^m \sinh u.$

62. $\cosh(u + mi\pi) = (-1)^m \cosh u.$

63. $\sinh(2m + 1)\frac{1}{2} i\pi = \pm i.$

64. $\cosh(2m + 1)\frac{1}{2} i\pi = 0.$

65. $$\sinh\left(\frac{i\pi}{2} \pm u\right) = i \cosh u.$$

66. $$\cosh\left(\frac{i\pi}{2} \pm u\right) = \pm i \sinh u.$$

66a. $\sinh \{ (u + iv) + i \frac{\pi}{2} \} = \sinh \{ (u + iv) + i \underline{1} \} = i \cosh (u + iv).$

66b. $\cosh \{ (u + iv) + i \frac{\pi}{2} \} = \cosh \{ (u + iv) + i \underline{1} \} = i \sinh (u + iv).$

66c. $\tanh \{ (u + iv) + i \frac{\pi}{2} \} = \tanh \{ (u + iv) + i \underline{1} \} = \coth (u + iv).$

66d. $\sinh \{ (u + iv) + i \pi \} = \sinh \{ (u + iv) + i \underline{2} \} = -\sinh (u + iv).$

66e. $\cosh \{ (u + iv) + i \pi \} = \cosh \{ (u + iv) + i \underline{2} \} = -\cosh (u + iv).$

66f. $\tanh \{ (u + iv) + i \pi \} = \tanh \{ (u + iv) + i \underline{2} \} = \tanh (u + iv).$

67. $\tanh (u + i\pi) = \tanh u.$

67a. If $\sinh \{ (u + i (\underline{1} - q) \} = x + iy$; then $\sinh \{ u + i (\underline{1} + q) \} = - x + iy.$

67b. If $\cosh \{ (u + i (\underline{1} - q) \} = x + iy$: then $\cosh \{ u + i (\underline{1} + q) \} = - x + iy.$

67c. If $\tanh \{ u + i (\underline{1} - q) \} = x + iy$: then $\tanh \{ u + i (\underline{1} + q) \} = x - iy.$

C. Inverse Hyperbolic Functions

68. $\sinh^{-1} u = \log (u + \sqrt{u^2 + 1}) = \cosh^{-1} \sqrt{u^2 + 1} = \int \frac{du}{(u^2 + 1)^{\frac{1}{2}}} \cdot$

69. $\cosh^{-1} u = \log (u + \sqrt{u^2 - 1}) = \sinh^{-1} \sqrt{u^2 - 1} = \int \frac{du}{(u^2 - 1)^{\frac{1}{2}}} \cdot$

70. $\tanh^{-1} u = \frac{1}{2} \log (1 + u) - \frac{1}{2} \log (1 - u) = \int \frac{du}{1 - u^2} \cdot$

71. $\coth^{-1} u = \frac{1}{2} \log (1 + u) - \frac{1}{2} \log (u - 1) = \int \frac{du}{1 - u^2} = \tanh^{-1} \frac{1}{u} \cdot$

72. $\operatorname{sech}^{-1} u = \log \left(\frac{1}{u} + \sqrt{\frac{1}{u^2} - 1} \right) = - \int \frac{du}{u(1 - u^2)^{\frac{1}{2}}} = \cosh^{-1} \frac{1}{u} \cdot$

73. $\operatorname{csch}^{-1} u = \log \left(\frac{1}{u} + \sqrt{\frac{1}{u^2} + 1} \right) = - \int \frac{du}{u(u^2 + 1)^{\frac{1}{2}}} = \sinh^{-1} \frac{1}{u} \cdot$

74. $\sin^{-1} u = - i \sinh^{-1} iu = - i \log (iu + \sqrt{1 - u^2}).$

75. $\cos^{-1} u = - i \cosh^{-1} u = - i \log (u + i \sqrt{1 - u^2}).$

76. $\tan^{-1} u = - i \tanh^{-1} iu = \frac{1}{2i} \log (1 + iu) - \frac{1}{2i} \log (1 - iu).$

77. $\cot^{-1} u = i \coth^{-1} iu = \frac{1}{2i} \log (iu - 1) - \frac{1}{2i} \log (iu + 1).$

78. $\sin^{-1} iu = i \sinh^{-1} u = i \log (u + \sqrt{1 + u^2}).$

79. $\cos^{-1} iu = - i \cosh^{-1} iu = \frac{\pi}{2} - i \log (u + \sqrt{1 + u^2}).$

80. $\tan^{-1} iu = i \tanh^{-1} u = \frac{i}{2} \log (1 + u) - \frac{i}{2} \log (1 - u).$

81. $\cot^{-1} iu = - i \coth^{-1} u = - \frac{i}{2} \log (u + 1) + \frac{i}{2} \log (u - 1).$

82. $\cosh^{-1} \frac{1}{2} \left(u + \frac{1}{u}\right) = \sinh^{-1} \frac{1}{2} \left(u - \frac{1}{u}\right) = \tanh^{-1} \frac{u^2 - 1}{u^2 + 1},$

$$= 2 \tanh^{-1} \frac{u - 1}{u + 1} = \log u.$$

83. $\tanh^{-1} \tan u = \frac{1}{2}\, gd\, 2u.$

84. $\tan^{-1} \tanh u = \frac{1}{2}\, gd^{-1}\, 2u.$

85. $\cosh^{-1} \csc 2u = - \sinh^{-1} \cot 2u = - \tanh^{-1} \cos 2u = \log \tan u.$

86. $\tanh^{-1} \tan^2 (\frac{1}{4} \pi + \frac{1}{2} u) = \frac{1}{2} \log \csc u.$

87. $\tanh^{-1} \tan^2 \frac{1}{2} u = \frac{1}{2} \log \sec u.$

88. $\cosh^{-1} u \pm \cosh^{-1} v = \cosh^{-1} \left[uv \pm \sqrt{(u^2 - 1)(v^2 - 1)}\right].$

89. $\sinh^{-1} u \pm \sinh^{-1} v = \sinh^{-1} \left[u \sqrt{1 + v^2} \pm v \sqrt{1 + u^2}\right].$

D. Series

90. $e^u = 1 + u + \frac{u^2}{2!} + \frac{u^3}{3!} + \frac{u^4}{4!} + \dots$ $(u^2 < \infty)$

91. $\log u = (u - 1) - \frac{1}{2} (u - 1)^2 + \frac{1}{3} (u - 1)^3 - \dots$ $(2 > u > 0)$

92. $\log u = \frac{u - 1}{u} + \frac{1}{2} \left(\frac{u - 1}{u}\right)^2 + \frac{1}{3} \left(\frac{u - 1}{u}\right)^3 + \dots$ $(u > \frac{1}{2})$

93. $\log u = 2 \left[\frac{u - 1}{u + 1} + \frac{1}{3} \left(\frac{u - 1}{u + 1}\right)^3 + \frac{1}{5} \left(\frac{u - 1}{u + 1}\right)^5 + \dots\right]$ $(u > 0)$

94. $\log (1 + u) = u - \frac{1}{2} u^2 + \frac{1}{3} u^3 - \frac{1}{4} u^4 + \dots$ $(u^2 < 1)$

95. $\log \left(\frac{1 + u}{1 - u}\right) = 2 \left[u + \frac{1}{3} u^3 + \frac{1}{5} u^5 + \frac{1}{7} u^7 + \dots\right]$ $(u^2 < 1)$

96. $\log \left(\frac{u + 1}{u - 1}\right) = 2 \left[\frac{1}{u} + \frac{1}{3} \left(\frac{1}{u}\right)^3 + \frac{1}{5} \left(\frac{1}{u}\right)^5 + \dots\right]$ $(u^2 > 1)$

97. $\sinh u = u + \frac{u^3}{3!} + \frac{u^5}{5!} + \frac{u^7}{7!} + \dots$ $(u^2 < \infty)$

$= u \left(1 + \frac{u^2}{\pi^2}\right) \left(1 + \frac{u^2}{2^2 \pi^2}\right) \left(1 + \frac{u^2}{3^2 \pi^2}\right) \dots$ $(u^2 < \infty)$

98. $$\cosh u = 1 + \frac{u^2}{2!} + \frac{u^4}{4!} + \frac{u^6}{6!} + \dots \qquad (u^2 < \infty)$$

$$= \left(1 + \frac{4\,u^2}{\pi^2}\right)\left(1 + \frac{4u^2}{3^2\,\pi^2}\right)\left(1 + \frac{4\,u^2}{5^2\,\pi^2}\right)\dots \qquad (u^2 < \infty)$$

99. $$\tanh u = u - \frac{1}{3}u^3 + \frac{2}{15}u^5 - \frac{17}{315}u^7 + \dots \qquad (u^2 < \tfrac{1}{4}\pi^2)$$

100. $$u \coth u = 1 + \frac{1}{3}u^2 - \frac{1}{45}u^4 + \frac{2}{945}u^6 - \dots \qquad (u^2 < \pi^2)$$

101. $$\operatorname{sech} u = 1 - \frac{1}{2}u^2 + \frac{5}{24}u^4 - \frac{61}{720}u^6 + \dots \qquad (u^2 < \tfrac{1}{4}\pi^2)$$

102. $$u \operatorname{csch} u = 1 - \frac{1}{6}u^2 + \frac{7}{360}u^4 - \frac{31}{15120}u^6 + \dots \qquad (u^2 < \pi^2)$$

103. $$gd\, u = \phi = u - \frac{1}{6}u^3 + \frac{1}{24}u^5 - \frac{61}{5040}u^7 + \dots \qquad (u \text{ small})$$

$$= \frac{\pi}{2} - \operatorname{sech} u - \frac{1}{2}\,\frac{\operatorname{sech}^3 u}{3} - \frac{1}{2}\,\frac{3}{4}\,\frac{\operatorname{sech}^5 u}{5} - \dots \qquad (u \text{ large})$$

104. $$u = gd^{-1}\phi = \phi + \frac{1}{6}\phi^3 + \frac{1}{24}\phi^5 + \frac{61}{5040}\phi^7 + \dots \qquad \left(\phi < \frac{\pi}{2}\right)$$

105. $$\sinh^{-1} u = u - \frac{1}{2}\,\frac{u^3}{3} + \frac{1}{2}\,\frac{3}{4}\,\frac{u^5}{5} - \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{u^7}{7} + \dots \qquad (u^2 < 1)$$

$$= \log 2u + \frac{1}{2}\,\frac{1}{2u^2} - \frac{1}{2}\,\frac{3}{4}\,\frac{1}{4u^4} + \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{1}{6u^6} - \dots \qquad (u^2 > 1)$$

106. $$\cosh^{-1} u = \log 2u - \frac{1}{2}\,\frac{1}{2u^2} - \frac{1}{2}\,\frac{3}{4}\,\frac{1}{4u^4} - \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{1}{6u^6} - \dots \qquad (u^2 > 1)$$

107. $$\tanh^{-1} u = u + \frac{1}{3}u^3 + \frac{1}{5}u^5 + \frac{1}{7}u^7 + \dots \qquad (u^2 < 1)$$

108. $$\coth^{-1} u = \tanh^{-1}\frac{1}{u} = \frac{1}{u} + \frac{1}{3u^3} + \frac{1}{5u^5} + \frac{1}{7u^7} + \dots \qquad (u^2 > 1)$$

109. $$\operatorname{sech}^{-1} u = \cosh^{-1}\frac{1}{u} = \log\frac{2}{u} - \frac{1}{2}\,\frac{u^2}{2} - \frac{1}{2}\,\frac{3}{4}\,\frac{u^4}{4} - \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{u^6}{6} - \dots \qquad (u^2 < 1)$$

110. $$\operatorname{csch}^{-1} u = \sinh^{-1}\frac{1}{u} = \frac{1}{u} - \frac{1}{2}\,\frac{1}{3u^3} + \frac{1}{2}\,\frac{3}{4}\,\frac{1}{5u^5} - \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{1}{7u^7} + \dots \qquad (u^2 > 1)$$

$$= \log\frac{2}{u} + \frac{1}{2}\,\frac{u^2}{2} - \frac{1}{2}\,\frac{3}{4}\,\frac{u^4}{4} + \frac{1}{2}\,\frac{3}{4}\,\frac{5}{6}\,\frac{u^6}{6} - \dots \qquad (u^2 < 1)$$

E. Derivatives

111. $\frac{d\,e^u}{du} = e^u.$

112. $d\frac{\log_e u}{du} = \frac{1}{u}\cdot$

113. $\frac{d\,a^v}{du} = a^v.\frac{dv}{du}.\log_e a.$

114. $\frac{d\,u^u}{du} = u^u(1 + \log_e u).$

115. $\frac{d\sinh u}{du} = \cosh u.$

116. $\frac{d\cosh u}{du} = \sinh u.$

117. $\frac{d\tanh u}{du} = \operatorname{sech}^2 u.$

118. $\frac{d\coth u}{du} = -\operatorname{csch}^2 u.$

119. $\frac{d\operatorname{sech} u}{du} = -\operatorname{sech} u.\ \tanh u.$

120. $\frac{d\operatorname{csch} u}{du} = -\operatorname{csch} u.\ \coth u.$

121. $\frac{d\sinh^{-1} u}{du} = \frac{1}{\sqrt{u^2 + 1}}.$

122. $\frac{d\cosh^{-1} u}{du} = \frac{1}{\sqrt{u^2 - 1}}.$

123. $\frac{d\tanh^{-1} u}{du} = \frac{1}{1 - u^2}.$

124. $\frac{d\coth^{-1} u}{du} = \frac{1}{1 - u^2}.$

125. $\frac{d\operatorname{sech}^{-1} u}{du} = \frac{-1}{u\sqrt{1 - u^2}}.$

126. $\frac{d\operatorname{csch}^{-1} u}{du} = \frac{-1}{u\sqrt{u^2 + 1}}.$

127. $\frac{d\operatorname{gd} u}{du} = \operatorname{sech} u.$

128. $\frac{d\operatorname{gd}^{-1} u}{du} = \sec u.$

F. Integrals. (Integration Constants are Omitted.)

129. $\int \sinh u\, du = \cosh u.$

130. $\int \cosh u\, du = \sinh u.$

131. $\int \tanh u\, du = \log \cosh u.$

132. $\int \coth u\, du = \log \sinh u.$

133. $\int \operatorname{sech} u\, du = 2 \tan^{-1} e^u = \operatorname{gd} u.$

134. $\int \operatorname{csch} u\, du = \log \tanh \frac{u}{2}.$

135. $\int \sinh^n u\, du = \frac{1}{n} \sinh^{n-1} u.\ \cosh u - \frac{n-1}{n} \int \sinh^{n-2} u\, du,$

$$= \frac{1}{n+1} \sinh^{n+1} u \cosh u - \frac{n+2}{n+1} \int \sinh^{n+2} u\, du.$$

136. $\int \cosh^n u\, du = \frac{1}{n} \sinh u.\ \cosh^{n-1} u + \frac{n-1}{n} \int \cosh^{n-2} u\, du,$

$$= -\frac{1}{n+1} \sinh u \cosh^{n+1} u + \frac{n+2}{n+1} \int \cosh^{n+2} u\, du.$$

137. $\int u \sinh u\, du = u \cosh u - \sinh u.$

138. $\int u \cosh u\, du = u \sinh u - \cosh u.$

139. $\int u^2 \sinh u\, du = (u^2 + 2) \cosh u - 2u \sinh u.$

140. $\int u^n \sinh u\, du = u^n \cosh u - nu^{n-1} \sinh u + n(n-1) \int u^{n-2} \sinh u\, du.$

141. $\int \sinh^2 u\, du = \frac{1}{2} (\sinh u \cosh u - u).$

142. $\int \sinh u.\ \cosh u\, du = \frac{1}{4} \cosh (2u).$

143. $\int \cosh^2 u\, du = \frac{1}{2} (\sinh u \cosh u + u).$

144. $\int \tanh^2 u\, du = u - \tanh u.$

145. $\int \coth^2 u\, du = u - \coth u.$

146. $\int \operatorname{sech}^2 u\, du = \tanh u.$

147. $\int \operatorname{sech}^3 u\, du = \frac{1}{2} \operatorname{sech} u \tanh u + \frac{1}{2} \operatorname{gd} u.$

148. $\int \operatorname{csch}^2 u\, du = - \coth u.$

149. $\int \sinh^{-1} u\, du = u \sinh^{-1} u - (1 + u^2)^{\frac{1}{2}}.$

150. $\int \cosh^{-1} u\, du = u \cosh^{-1} u - (u^2 - 1)^{\frac{1}{2}}.$

151. $\int \tanh^{-1} u\, du = u \tanh^{-1} u + \frac{1}{2} \log (1 - u^2).$

152. $\int u \sinh^{-1} u\, du = \frac{1}{4} \left[(2\, u^2 + 1) \sinh^{-1} u - u\, (1 + u^2)^{\frac{1}{2}} \right].$

153. $\int u \cosh^{-1} u\, du = \frac{1}{4} \left[(2\, u^2 - 1) \cosh^{-1} u - u\, (u^2 - 1)^{\frac{1}{2}} \right].$

154. $\int (\cosh a + \cosh u)^{-1}\, du = 2 \operatorname{csch} a.\ \tanh^{-1} (\tanh \frac{1}{2} u.\ \tanh \frac{1}{2} a),$

$$= \operatorname{csch} a \left[\log \cosh \tfrac{1}{2} (u + a) - \log \cosh \tfrac{1}{2} (u - a) \right].$$

155. $\int (\cos a + \cosh u)^{-1}\, du = 2 \csc a.\ \tan^{-1}(\tanh \frac{1}{2} u.\ \tan \frac{1}{2} a).$

156. $\int (1 + \cos a.\ \cosh u)^{-1}\, du = 2 \csc a.\ \tanh^{-1} (\tanh \frac{1}{2} u.\ \tan \frac{1}{2} a).$

157. $\int \sinh u \cos u\, du = \frac{1}{2} (\cosh u.\ \cos u + \sinh u.\ \sin u).$

158. $\int \cosh u.\ \cos u\, du = \frac{1}{2} (\sinh u.\ \cos u + \cosh u.\ \sin u).$

159. $\int \sinh u.\ \sin u\, du = \frac{1}{2} (\cosh u.\ \sin u - \sinh u.\ \cos u).$

160. $\int \cosh u.\ \sin u\, du = \frac{1}{2} (\sinh u.\ \sin u - \cosh u.\ \cos u).$

161. $\int \sinh(mu) \sinh(nu)\, du$

$$= \frac{1}{m^2 - n^2}\Big[m \sinh(nu) \cosh(mu) - n \cosh(nu) \sinh(mu)\Big].$$

162. $\int \cosh(mu) \sinh(nu)\, du$

$$= \frac{1}{m^2 - n^2}\Big[m \sinh(nu) \sinh(mu) - n \cosh(nu) \cosh(mu)\Big].$$

163. $\int \cosh(mu) \cosh(nu)\, du$

$$= \frac{1}{m^2 - n^2}\Big[m \sinh(mu) \cosh(nu) - n \sinh(nu) \cosh(mu)\Big].$$

164. $\int \sinh u \tanh u\, du = \sinh u - gd\, u.$

165. $\int \cosh u \coth u\, du = \cosh u + \log \tanh \frac{u}{2}.$

166. $\int \sec u\, du = \text{gd}^{-1} u.$

167. $\int \sec^3 \phi\, d\phi = \int (1 + \tan^2 \phi)^{\frac{1}{2}}\, d \tan \phi = \frac{1}{2} \sec \phi \tan \phi + \frac{1}{2} \text{gd}^{-1} \phi,$

$= \frac{1}{2} \tan \phi\, (1 + \tan^2 \phi)^{\frac{1}{2}} + \frac{1}{2} \sinh^{-1}(\tan \phi).$ Here $\phi = gd\, u.$

168. $\int \frac{du}{(u^2 + a^2)^{\frac{1}{2}}} = \sinh^{-1} \frac{u}{a}.$ $\quad \int \frac{du}{(a^2 - u^2)^{\frac{1}{2}}} = \sin^{-1} \frac{u}{a}.$

169. $\int \frac{du}{(u^2 - a^2)^{\frac{1}{2}}} = \cosh^{-1} \frac{u}{a}.$ $\quad \int \frac{-du}{(a^2 - u^2)^{\frac{1}{2}}} = \cos^{-1} \frac{u}{a}.$

170. $\int \frac{du}{(a^2 - u^2)_{u<a}} = \frac{1}{a} \tanh^{-1} \frac{u}{a}.$ $\quad \int \frac{du}{a^2 + u^2} = \frac{1}{a} \tan^{-1} \frac{u}{a}.$

171. $\int \frac{-du}{(u^2 - a^2)_{u>a}} = \frac{1}{a} \coth^{-1} \frac{u}{a}.$ $\quad \int \frac{-du}{a^2 + u^2} = \frac{1}{a} \cot^{-1} \frac{u}{a}.$

172. $\int \frac{-du}{u\,(a^2 - u^2)^{\frac{1}{2}}} = \frac{1}{a} \text{sech}^{-1} \frac{u}{a}.$ $\quad \int \frac{du}{u\,(u^2 - a^2)^{\frac{1}{2}}} = \frac{1}{a} \sec^{-1} \frac{u}{a}.$

173. $\int \frac{-du}{u(a^2 + u^2)^{\frac{1}{2}}} = \frac{1}{a} \text{csch}^{-1} \frac{u}{a}.$ $\quad \int \frac{-du}{u\,(u^2 - a^2)} = \frac{1}{a} \csc^{-1} \frac{u}{a}.$

174. $\int \frac{du}{(au^2 + 2\,bu + c)^{\frac{1}{2}}} = \frac{1}{\sqrt{a}} \sinh^{-1} \frac{au + b}{(ac - b^2)^{\frac{1}{2}}},$ a positive, $ac > b^2$;

$= \frac{1}{\sqrt{a}} \cosh^{-1} \frac{au + b}{(b^2 - ac)^{\frac{1}{2}}},$ a positive, $ac < b^2$;

$= \frac{1}{\sqrt{-a}} \cos^{-1} \frac{au + b}{(b^2 - ac)^{\frac{1}{2}}},$ a negative.

175. $$\int \frac{du}{(au^2 + 2bu + c)} = \frac{1}{(ac - b^2)^{\frac{1}{2}}} \tan^{-1} \frac{au + b}{(ac - b^2)^{\frac{1}{2}}}, \qquad ac > b^2;$$

$$= \frac{-1}{(b^2 - ac)^{\frac{1}{2}}} \tanh^{-1} \frac{au + b}{(b^2 - ac)^{\frac{1}{2}}}, \qquad ac < b^2, \; au + b < (b^2 - ac)^{\frac{1}{2}}.$$

$$= \frac{-1}{(b^2 - ac)^{\frac{1}{2}}} \coth^{-1} \frac{au + b}{(b^2 - ac)^{\frac{1}{2}}}, \qquad ac < b^2, \; au + b > (b^2 - ac)^{\frac{1}{2}}.$$

176. $$\int \frac{du}{(a - u)\,(u - b)^{\frac{1}{2}}} = \frac{2}{(a - b)^{\frac{1}{2}}} \tanh^{-1} \sqrt{\frac{u - b}{a - b}},$$

$$\text{or } \frac{-2}{(b - a)^{\frac{1}{2}}} \tan^{-1} \sqrt{\frac{u - b}{b - a}},$$

$$\text{or } \frac{2}{(a - b)^{\frac{1}{2}}} \coth^{-1} \sqrt{\frac{u - b}{a - b}}.$$ (The real form is to be taken.)

177. $$\int \frac{du}{(a - u)\,(b - u)^{\frac{1}{2}}} = \frac{2}{(b - a)^{\frac{1}{2}}} \tanh^{-1} \sqrt{\frac{b - u}{b - a}},$$

$$\text{or } \frac{2}{(b - a)^{\frac{1}{2}}} \coth^{-1} \sqrt{\frac{b - u}{b - a}},$$

$$\text{or } \frac{-2}{(a - b)^{\frac{1}{2}}} \tan^{-1} \sqrt{\frac{b - u}{a - b}}.$$ (The real form is to be taken.)

178. $$\int (u^2 - a^2)^{\frac{1}{2}}\, du = \tfrac{1}{2} u\, (u^2 - a^2)^{\frac{1}{2}} - \tfrac{1}{2} a^2 \cosh^{-1} \frac{u}{a}.$$

179. $$\int (a^2 - u^2)^{\frac{1}{2}}\, du = \tfrac{1}{2} u\, (a^2 - u^2)^{\frac{1}{2}} + \tfrac{1}{2} a^2 \sin^{-1} \frac{u}{a}.$$

180. $$\int (u^2 + a^2)^{\frac{1}{2}}\, du = \tfrac{1}{2} u\, (u^2 + a^2)^{\frac{1}{2}} + \tfrac{1}{2} a^2 \sinh^{-1} \frac{u}{a}.$$

181. $$\int e^{au}\, du = \frac{e^{au}}{a}.$$

182. $$\int u e^{au}\, du = \frac{e^{au}}{a^2} (au - 1).$$

183. $$\int u^m \cdot e^{au}\, du = \frac{u^m e^{au}}{a} - \frac{m}{a} \int u^{m-1} e^{au}\, du.$$

184. $$\int \frac{e^{au}\, du}{u^m} = \frac{1}{m - 1} \left[-\frac{e^{au}}{u^{m-1}} + a \int \frac{e^{au}\, du}{u^{m-1}} \right].$$

185. $$\int a^{bu}\, du = \frac{a^{bu}}{b \log a}.$$

186. $$\int u^n a^u\, du = \frac{a^u u^n}{\log a} - \frac{na^u u^{n-1}}{(\log a)^2} + \frac{n(n-1)a^u u^{n-2}}{(\log a)^3} \cdots \pm \frac{n(n-1)(n-2)\cdots 2.1\, a^u}{(\log a)^{n+1}}.$$

187. $$\int \frac{a^u\, du}{u^n} = \frac{a^u}{n-1}\left[-\frac{1}{u^{n-1}} - \frac{\log a}{(n-2)u^{n-2}} - \frac{(\log a)^2}{(n-2)(n-3)u^{n-3}} - \cdots + \frac{(\log a)^{n-1}}{(n-2)(n-3)\cdots 2.1}\int \frac{a^u\, du}{u}\right].$$

188. $$\int \frac{a^u\, du}{u} = \log u + u \log a + \frac{(u \log a)^2}{2.2!} + \frac{(u \log a)^3}{3 \cdot 3!} + \cdots.$$

189. $$\int \frac{du}{1 + e^u} = \log \frac{e^u}{1 + e^u}.$$

190. $$\int \frac{du}{a + be^{mu}} = \frac{1}{am}\left[mu - \log(a + be^{mu})\right].$$

191. $$\int \frac{du}{ae^{mu} + be^{-mu}} = \frac{1}{m(ab)^{\frac{1}{2}}} \tan^{-1}\left(e^{mu}\sqrt{\frac{a}{b}}\right).$$

192. $$\int \frac{du}{(a + be^{mu})^{\frac{1}{2}}} = \frac{1}{m\sqrt{a}}\left[\log(\sqrt{a + be^{mu}} - \sqrt{a}) - \log(\sqrt{a + be^{mu}} + \sqrt{a})\right].$$

193. $$\int \frac{ue^u\, du}{(1 + u)^2} = \frac{e^u}{1 + u}.$$

194. $$\int e^{au} \log u\, du = \frac{e^{au} \log u}{a} - \frac{1}{a}\int \frac{e^{au}\, du}{u}.$$

195. $$\int \log u\, du = u \log u - u.$$

196. $$\int u^m \log u\, du = u^{m+1}\left[\frac{\log u}{m + 1} - \frac{1}{(m + 1)^2}\right].$$

197. $$\int (\log u)^n\, du = u(\log u)^n - n\int (\log u)^{n-1}\, du.$$

198. $$\int u^m (\log u)^n\, du = \frac{u^{m+1}(\log u)^n}{m + 1} - \frac{n}{m + 1}\int u^m (\log u)^{n-1}\, du.$$

199. $$\int \frac{(\log u)^n\, du}{u} = \frac{(\log u)^{n+1}}{n + 1}.$$

200. $$\int \frac{du}{\log u} = \log(\log u) + \log u + \frac{(\log u)^2}{2.2!} + \frac{(\log u)^3}{3 \cdot 3!} + \cdots.$$

201. $$\int \frac{du}{(\log u)^n} = -\frac{u}{(n-1)(\log u)^{n-1}} + \frac{1}{n-1}\int \frac{du}{(\log u)^{n-1}}.$$

202. $$\int \frac{u^m\,du}{(\log u)^n} = -\frac{u^{m+1}}{(n-1)(\log u)^{n-1}} + \frac{m+1}{n-1}\int \frac{u^m\,du}{(\log u)^{n-1}}.$$

203. $$\int \frac{u^m\,du}{\log u} = \int \frac{e^{-y}}{y}\,dy, \text{ where } y = -(m+1)\log u.$$

204. $$\int \frac{du}{u \log u} = \log(\log u).$$

205. $$\int \frac{du}{u(\log u)^n} = -\frac{1}{(n-1)(\log u)^{n-1}}.$$

206. $$\int (a+bu)^m \log u\,du = \frac{1}{b(m+1)}\left[(a+bu)^{m+1}\log u - \int \frac{(a+bu)^{m+1}\,du}{u}\right].$$

207. $$\int u^m \log(a+bu)\,du = \frac{1}{m+1}\left[u^{m+1}\log(a+bu) - b\int \frac{u^{m+1}\,du}{a+bu}\right].$$

208. $$\int \frac{\log(a+bu)\,du}{u} = \log a.\log u + \frac{bu}{a} - \frac{1}{2^2}\left(\frac{bu}{a}\right)^2 + \frac{1}{3^2}\left(\frac{bu}{a}\right)^3 - \cdots,$$
$$= \frac{1}{2}(\log bu)^2 - \frac{a}{bu} + \frac{1}{2^2}\left(\frac{a}{bu}\right)^2 - \frac{1}{3^2}\left(\frac{a}{bu}\right)^3 + \cdots\cdots$$

209. $$\int \frac{\log u\,du}{(a+bu)^m} = \frac{1}{b(m-1)}\left[-\frac{\log u}{(a+bu)^{m-1}} + \int \frac{du}{u(a+bu)^{m-1}}\right].$$

210. $$\int \frac{\log u\,du}{a+bu} = \frac{1}{b}\log u.\ \log(a+bu) - \frac{1}{b}\int \frac{\log(a+bu)}{u}\,du.$$

211. $$\int (a+bu)\log u\,du = \frac{(a+bu)^2}{2b}\log u - \frac{a^2\log u}{2b} - au - \tfrac{1}{4}bu^2.$$

212. $$\int \frac{\log u\,du}{(a+bu)^{\frac{1}{2}}} = \frac{2}{b}\Big[(\log u - 2)\sqrt{(a+bu)} + \sqrt{a}\log(\sqrt{a+bu} + \sqrt{a}) - \sqrt{a}\log(\sqrt{a+bu} - \sqrt{a})\Big], \text{ if } a > 0,$$
$$= \frac{2}{b}\left[(\log u - 2)\sqrt{(a+bu)} + 2\sqrt{-a}\tan^{-1}\sqrt{\frac{a+bu}{-a}}\right], \text{ if } a < 0.$$

213. $\int_0^\infty e^{-a^2u^2}\,du = \frac{\sqrt{\pi}}{2a} = \frac{1}{2a}\Gamma\left(\frac{1}{2}\right).$

214. $\int_0^\infty u^n e^{-au}\,du = \Gamma\frac{(n+1)}{a^{n+1}} = \frac{n!}{a^{n+1}}.$

215. $\int_0^\infty u^{2n} e^{-au^2}\,du = \frac{1.3.5\ldots(2n-1)}{2^{n+1}a^n}\sqrt{\frac{\pi}{a}}.$

216. $\int_0^\infty e^{-u^2-\frac{a^2}{u^2}}\,du = \frac{e^{-2a}}{2}\sqrt{\pi}.$ $a > 0.$

217. $\int_0^\infty e^{-nu}\sqrt{u}\,du = \frac{1}{2n}\sqrt{\frac{\pi}{n}}.$

218. $\int_0^\infty \frac{e^{-nu}}{\sqrt{u}}\,du = \sqrt{\frac{\pi}{n}}.$ $a > 0.$

219. $\int_0^\infty \frac{du}{\sinh(nu)} = \frac{\pi}{2n}.$

220. $\int_0^\infty \frac{u\,du}{\sinh(nu)} = \frac{\pi^2}{4n^2}.$

221. $\int_0^{i\pi} \sinh(mu).\sinh(nu)\,du = \int_0^{i\pi} \cosh(mu).\cosh(nu)\,du$

$= 0$, if m is different from n.

222. $\int_0^{i\pi} \cosh^2(mu)\,du = -\int_0^{i\pi} \sinh^2(mu)\,du = \frac{i\pi}{2}.$

223. $\int_{-i\pi}^{+i\pi} \sinh(mu)\,du = 0.$

224. $\int_0^{i\pi} \cosh(mu)\,du = 0.$

225. $\int_{-i\pi}^{i\pi} \sinh(mu)\cosh(nu)\,du = 0.$

226. $\int_0^{i\pi} \sinh(mu)\cosh(mu)\,du = 0.$

227. $\int_0^1 \frac{\log u}{1-u}\,du = -\frac{\pi^2}{6}.$

228. $\int_0^1 \frac{\log u}{1+u}\,du = -\frac{\pi^2}{12}.$

229. $\int_0^1 \frac{\log u}{1-u^2}\,du = -\frac{\pi^2}{8}.$

230. $$\int_0^1 \log\left(\frac{1+u}{1-u}\right)\cdot\frac{du}{u} = \frac{\pi^2}{4}.$$

231. $$\int_0^1 \frac{\log u\,du}{(1-u^2)^{\frac{1}{2}}} = -\frac{\pi}{2}\log 2.$$

232. $$\int_0^1 \frac{(u^p-u^q)\,du}{\log u} = \log\frac{p+1}{q+1}, \text{ if } p+1>0, q+1>0.$$

233. $$\int_0^1 (\log u)^n\,du = (-1)^n . n\,!.$$

234. $$\int_0^1 \left(\log\frac{1}{u}\right)^{\frac{1}{2}} du = \frac{\sqrt{\pi}}{2}.$$

235. $$\int_0^1 \left(\log\frac{1}{u}\right)^n du = n\,!.$$

236. $$\int_0^1 \frac{du}{\left(\log\frac{1}{u}\right)^{\frac{1}{2}}} = \sqrt{\pi}.$$

237. $$\int_0^1 u^m \log\left(\frac{1}{u}\right)^n du = \frac{\Gamma(n+1)}{(m+1)^{n+1}}, \text{ if } m+1>0, n+1>0.$$

238. $$\int_0^\infty \log\left(\frac{e^u+1}{e^u-1}\right) du = \frac{\pi^2}{4}.$$