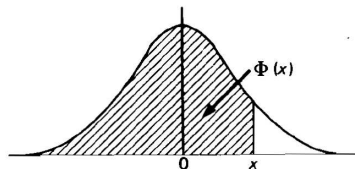


TABLE 4. THE NORMAL DISTRIBUTION FUNCTION

The function tabulated is $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-t^2/2} dt$. $\Phi(x)$ is

the probability that a random variable, normally distributed with zero mean and unit variance, will be less than or equal to x . When $x < 0$ use $\Phi(x) = 1 - \Phi(-x)$, as the normal distribution with zero mean and unit variance is symmetric about zero.



x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)	x	Φ(x)
0.00	0.5000	0.40	0.6554	0.80	0.7881	1.20	0.8849	1.60	0.9452	2.00	0.97725
0.01	0.5040	0.41	0.6591	0.81	0.7910	1.21	0.8869	1.61	0.9463	2.01	0.97778
0.02	0.5080	0.42	0.6628	0.82	0.7939	1.22	0.8888	1.62	0.9474	2.02	0.97831
0.03	0.5120	0.43	0.6664	0.83	0.7967	1.23	0.8907	1.63	0.9484	2.03	0.97882
0.04	0.5160	0.44	0.6700	0.84	0.7995	1.24	0.8925	1.64	0.9495	2.04	0.97932
0.05	0.5199	0.45	0.6736	0.85	0.8023	1.25	0.8944	1.65	0.9505	2.05	0.97982
0.06	0.5239	0.46	0.6772	0.86	0.8051	1.26	0.8962	1.66	0.9515	2.06	0.98030
0.07	0.5279	0.47	0.6808	0.87	0.8078	1.27	0.8980	1.67	0.9525	2.07	0.98077
0.08	0.5319	0.48	0.6844	0.88	0.8106	1.28	0.8997	1.68	0.9535	2.08	0.98124
0.09	0.5359	0.49	0.6879	0.89	0.8133	1.29	0.9015	1.69	0.9545	2.09	0.98169
0.10	0.5398	0.50	0.6915	0.90	0.8159	1.30	0.9032	1.70	0.9554	2.10	0.98214
0.11	0.5438	0.51	0.6950	0.91	0.8186	1.31	0.9049	1.71	0.9564	2.11	0.98257
0.12	0.5478	0.52	0.6985	0.92	0.8212	1.32	0.9066	1.72	0.9573	2.12	0.98300
0.13	0.5517	0.53	0.7019	0.93	0.8238	1.33	0.9082	1.73	0.9582	2.13	0.98341
0.14	0.5557	0.54	0.7054	0.94	0.8264	1.34	0.9099	1.74	0.9591	2.14	0.98382
0.15	0.5596	0.55	0.7088	0.95	0.8289	1.35	0.9115	1.75	0.9599	2.15	0.98422
0.16	0.5636	0.56	0.7123	0.96	0.8315	1.36	0.9131	1.76	0.9608	2.16	0.98461
0.17	0.5675	0.57	0.7157	0.97	0.8340	1.37	0.9147	1.77	0.9616	2.17	0.98500
0.18	0.5714	0.58	0.7190	0.98	0.8365	1.38	0.9162	1.78	0.9625	2.18	0.98537
0.19	0.5753	0.59	0.7224	0.99	0.8389	1.39	0.9177	1.79	0.9633	2.19	0.98574
0.20	0.5793	0.60	0.7257	1.00	0.8413	1.40	0.9192	1.80	0.9641	2.20	0.98610
0.21	0.5832	0.61	0.7291	1.01	0.8438	1.41	0.9207	1.81	0.9649	2.21	0.98645
0.22	0.5871	0.62	0.7324	1.02	0.8461	1.42	0.9222	1.82	0.9656	2.22	0.98679
0.23	0.5910	0.63	0.7357	1.03	0.8485	1.43	0.9236	1.83	0.9664	2.23	0.98713
0.24	0.5948	0.64	0.7389	1.04	0.8508	1.44	0.9251	1.84	0.9671	2.24	0.98745
0.25	0.5987	0.65	0.7422	1.05	0.8531	1.45	0.9265	1.85	0.9678	2.25	0.98778
0.26	0.6026	0.66	0.7454	1.06	0.8554	1.46	0.9279	1.86	0.9686	2.26	0.98809
0.27	0.6064	0.67	0.7486	1.07	0.8577	1.47	0.9292	1.87	0.9693	2.27	0.98840
0.28	0.6103	0.68	0.7517	1.08	0.8599	1.48	0.9306	1.88	0.9699	2.28	0.98870
0.29	0.6141	0.69	0.7549	1.09	0.8621	1.49	0.9319	1.89	0.9706	2.29	0.98899
0.30	0.6179	0.70	0.7580	1.10	0.8643	1.50	0.9332	1.90	0.9713	2.30	0.98928
0.31	0.6217	0.71	0.7611	1.11	0.8665	1.51	0.9345	1.91	0.9719	2.31	0.98956
0.32	0.6255	0.72	0.7642	1.12	0.8686	1.52	0.9357	1.92	0.9726	2.32	0.98983
0.33	0.6293	0.73	0.7673	1.13	0.8708	1.53	0.9370	1.93	0.9732	2.33	0.99010
0.34	0.6331	0.74	0.7704	1.14	0.8729	1.54	0.9382	1.94	0.9738	2.34	0.99036
0.35	0.6368	0.75	0.7734	1.15	0.8749	1.55	0.9394	1.95	0.9744	2.35	0.99061
0.36	0.6406	0.76	0.7764	1.16	0.8770	1.56	0.9406	1.96	0.9750	2.36	0.99086
0.37	0.6443	0.77	0.7794	1.17	0.8790	1.57	0.9418	1.97	0.9756	2.37	0.99111
0.38	0.6480	0.78	0.7823	1.18	0.8810	1.58	0.9429	1.98	0.9761	2.38	0.99134
0.39	0.6517	0.79	0.7852	1.19	0.8830	1.59	0.9441	1.99	0.9767	2.39	0.99158
0.40	0.6554	0.80	0.7881	1.20	0.8849	1.60	0.9452	2.00	0.9772	2.40	0.99180
2.40	0.99180	2.55	0.99461	2.70	0.99653	2.85	0.99781	3.00	0.99865	3.15	0.99918
0.41	0.99202	0.56	0.99477	0.71	0.99664	0.86	0.99788	0.01	0.99869	0.16	0.99921
0.42	0.99224	0.57	0.99492	0.72	0.99674	0.87	0.99795	0.02	0.99874	0.17	0.99924
0.43	0.99245	0.58	0.99506	0.73	0.99683	0.88	0.99801	0.03	0.99878	0.18	0.99926
0.44	0.99266	0.59	0.99520	0.74	0.99693	0.89	0.99807	0.04	0.99882	0.19	0.99929
2.45	0.99286	2.60	0.99534	2.75	0.99702	2.90	0.99813	3.05	0.99886	3.20	0.99931
0.46	0.99305	0.61	0.99547	0.76	0.99711	0.91	0.99819	0.06	0.99889	0.21	0.99934
0.47	0.99324	0.62	0.99560	0.77	0.99720	0.92	0.99825	0.07	0.99893	0.22	0.99936
0.48	0.99343	0.63	0.99573	0.78	0.99728	0.93	0.99831	0.08	0.99896	0.23	0.99938
0.49	0.99361	0.64	0.99585	0.79	0.99736	0.94	0.99836	0.09	0.99900	0.24	0.99940
2.50	0.99379	2.65	0.99598	2.80	0.99744	2.95	0.99841	3.10	0.99903	3.25	0.99942
0.51	0.99396	0.66	0.99609	0.81	0.99752	0.96	0.99846	0.11	0.99906	0.26	0.99944
0.52	0.99413	0.67	0.99621	0.82	0.99760	0.97	0.99851	0.12	0.99910	0.27	0.99946
0.53	0.99430	0.68	0.99632	0.83	0.99767	0.98	0.99856	0.13	0.99913	0.28	0.99948
0.54	0.99446	0.69	0.99643	0.84	0.99774	0.99	0.99861	0.14	0.99916	0.29	0.99950
2.55	0.99461	2.70	0.99653	2.85	0.99781	3.00	0.99865	3.15	0.99918	3.30	0.99952

The critical table below gives on the left the range of values of x for which $\Phi(x)$ takes the value on the right, correct to the last figure given; in critical cases, take the upper of the two values of $\Phi(x)$ indicated.

3.075	0.9990	3.263	0.9994	3.731	0.99990	3.916	0.99995
3.105	0.9991	3.320	0.9995	3.759	0.99991	3.976	0.99996
3.138	0.9992	3.380	0.9996	3.791	0.99992	4.055	0.99997
3.174	0.9993	3.480	0.9997	3.826	0.99993	4.173	0.99998
3.215	0.9994	3.615	0.9998	3.867	0.99994	4.417	0.99999
			0.9999		0.99995		1.00000

When $x > 3.3$ the formula $1 - \Phi(x) \approx \frac{e^{-x^2}}{x\sqrt{2\pi}} \left[1 - \frac{1}{x^2} + \frac{3}{x^4} - \frac{15}{x^6} + \frac{105}{x^8} \right]$ is very accurate, with relative error less than $945/x^{10}$.