A.2 Standardnormalverteilung $\Phi(z)$

Standardnormalverteilung $\Phi(z)$ ($\Phi(-z) = 1 - \Phi(z)$):

z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Ablesebeispiel: Der Funktionswert für $z = 0.23$ steht in der Zeile 0.2 und der Spalte 0.03. Also $\Phi(0.23) = 0.591$.

p-Quantile z_p ($z_{1-p} = -z_p$):

p	0.6	0.7	0.8	0.9	0.95	0.975	0.99	0.995	0.999	0.9995
z_p	0.2533	0.5244	0.8416	1.2816	1.6449	1.9600	2.3263	2.5758	3.0902	3.2905

A.3 Quantile der Chi-Quadrat-Verteilung

p-Quantile $\chi^2_{m;p}$:

$m \setminus p$	0.005	0.01	0.025	0.05	0.1	0.9	0.95	0.975	0.99	0.995
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.60
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.14	13.28	14.86
5	0.412	0.554	0.831	1.145	1.610	9.236	11.07	12.83	15.09	16.75
6	0.676	0.872	1.237	1.635	2.204	10.64	12.59	14.45	16.81	18.55
7	0.989	1.239	1.690	2.167	2.833	12.02	14.07	16.01	18.48	20.28
8	1.344	1.646	2.180	2.733	3.490	13.36	15.51	17.53	20.09	21.95
9	1.735	2.088	2.700	3.325	4.168	14.68	16.92	19.02	21.67	23.59
10	2.156	2.558	3.247	3.940	4.865	15.99	18.31	20.48	23.21	25.19
11	2.603	3.053	3.816	4.575	5.578	17.28	19.68	21.92	24.72	26.76
12	3.074	3.571	4.404	5.226	6.304	18.55	21.03	23.34	26.22	28.30
13	3.565	4.107	5.009	5.892	7.042	19.81	22.36	24.74	27.69	29.82
14	4.075	4.660	5.629	6.571	7.790	21.06	23.68	26.12	29.14	31.32
15	4.601	5.229	6.262	7.261	8.547	22.31	25.00	27.49	30.58	32.80
16	5.142	5.812	6.908	7.962	9.312	23.54	26.30	28.85	32.00	34.27
17	5.697	6.408	7.564	8.672	10.09	24.77	27.59	30.19	33.41	35.72
18	6.265	7.015	8.231	9.390	10.86	25.99	28.87	31.53	34.81	37.16
19	6.844	7.633	8.907	10.12	11.65	27.20	30.14	32.85	36.19	38.58
20	7.434	8.260	9.591	10.85	12.44	28.41	31.41	34.17	37.57	40.00
21	8.034	8.897	10.28	11.59	13.24	29.62	32.67	35.48	38.93	41.40
22	8.643	9.542	10.98	12.34	14.04	30.81	33.92	36.78	40.29	42.80
23	9.260	10.20	11.69	13.09	14.85	32.01	35.17	38.08	41.64	44.18
24	9.886	10.86	12.40	13.85	15.66	33.20	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	16.47	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	18.11	36.74	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	19.77	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
31	14.46	15.66	17.54	19.28	21.43	41.42	44.99	48.23	52.19	55.00
32	15.13	16.36	18.29	20.07	22.27	42.58	46.19	49.48	53.49	56.33
33	15.82	17.07	19.05	20.87	23.11	43.75	47.40	50.73	54.78	57.65
34	16.50	17.79	19.81	21.66	23.95	44.90	48.60	51.97	56.06	58.96
35	17.19	18.51	20.57	22.47	24.80	46.06	49.80	53.20	57.34	60.27
36	17.89	19.23	21.34	23.27	25.64	47.21	51.00	54.44	58.62	61.58
37	18.59	19.96	22.11	24.07	26.49	48.36	52.19	55.67	59.89	62.88
38	19.29	20.69	22.88	24.88	27.34	49.51	53.38	56.90	61.16	64.18
39	20.00	21.43	23.65	25.70	28.20	50.66	54.57	58.12	62.43	65.48

Ablesebeispiel: $\chi^2_{12;0.9} = 18.55$

Für $m > 39$ kann folgende Approximation verwendet werden:

$$\chi^2_{m;p} \approx m(1 - \frac{2}{9m} + z_p\sqrt{\frac{2}{9m}})^3,$$

wobei z_p das p-Quantil der Standardnormalverteilung ist.

A.4 Quantile der t-Verteilung

p-Quantile $t_{m;p}$ ($t_{m;1-p} = -t_{m;p}$):

$m \setminus p$	0.9	0.95	0.975	0.99	0.995	0.999
1	3.078	6.314	12.71	31.82	63.66	318.3
2	1.886	2.920	4.303	6.965	9.925	22.33
3	1.638	2.353	3.182	4.541	5.841	10.21
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
31	1.309	1.696	2.040	2.453	2.744	3.375
32	1.309	1.694	2.037	2.449	2.738	3.365
33	1.308	1.692	2.035	2.445	2.733	3.356
34	1.307	1.691	2.032	2.441	2.728	3.348
35	1.306	1.690	2.030	2.438	2.724	3.340
36	1.306	1.688	2.028	2.434	2.719	3.333
37	1.305	1.687	2.026	2.431	2.715	3.326
38	1.304	1.686	2.024	2.429	2.712	3.319
39	1.304	1.685	2.023	2.426	2.708	3.313

Ablesebeispiel: $t_{12;0.9} = 1.356$

Für $m > 39$ kann folgende Approximation verwendet werden:

$$t_{m;p} \approx z_p(1 + \frac{1 + z_p^2}{4m}),$$

wobei z_p das Quantil der Standardnormalverteilung ist.

A.5 Quantile der F-Verteilung

p-Quantile $F_{m_1;m_2;p=0.95}$:

$m_1 \backslash m_2$	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30
1	161	18.5	10.1	7.71	6.61	5.99	5.59	5.32	5.12	4.96	4.75	4.60	4.49	4.41	4.35	4.30	4.26	4.23	4.20	4.17
2	199	19.0	9.55	6.94	5.79	5.14	4.74	4.46	4.26	4.10	3.89	3.74	3.63	3.55	3.49	3.44	3.40	3.37	3.34	3.32
3	216	19.2	9.28	6.59	5.41	4.76	4.35	4.07	3.86	3.71	3.49	3.34	3.24	3.16	3.10	3.05	3.01	2.98	2.95	2.92
4	225	19.2	9.12	6.39	5.19	4.53	4.12	3.84	3.63	3.48	3.26	3.11	3.01	2.93	2.87	2.82	2.78	2.74	2.71	2.69
5	230	19.3	9.01	6.26	5.05	4.39	3.97	3.69	3.48	3.33	3.11	2.96	2.85	2.77	2.71	2.66	2.62	2.59	2.56	2.53
6	234	19.3	8.94	6.16	4.95	4.28	3.87	3.58	3.37	3.22	3.00	2.85	2.74	2.66	2.60	2.55	2.51	2.47	2.45	2.42
7	237	19.4	8.89	6.09	4.88	4.21	3.79	3.50	3.29	3.14	2.91	2.76	2.66	2.58	2.51	2.46	2.42	2.39	2.36	2.33
8	239	19.4	8.85	6.04	4.82	4.15	3.73	3.44	3.23	3.07	2.85	2.70	2.59	2.51	2.45	2.40	2.36	2.32	2.29	2.27
9	241	19.4	8.81	6.00	4.77	4.10	3.68	3.39	3.18	3.02	2.80	2.65	2.54	2.46	2.39	2.34	2.30	2.27	2.24	2.21
10	242	19.4	8.79	5.96	4.74	4.06	3.64	3.35	3.14	2.98	2.75	2.60	2.49	2.41	2.35	2.30	2.25	2.22	2.19	2.16
12	244	19.4	8.74	5.91	4.68	4.00	3.57	3.28	3.07	2.91	2.69	2.53	2.42	2.34	2.28	2.23	2.18	2.15	2.12	2.09
14	245	19.4	8.71	5.87	4.64	3.96	3.53	3.24	3.03	2.86	2.64	2.48	2.37	2.29	2.22	2.17	2.13	2.09	2.06	2.04
16	246	19.4	8.69	5.84	4.60	3.92	3.49	3.20	2.99	2.83	2.60	2.44	2.33	2.25	2.18	2.13	2.09	2.05	2.02	1.99
18	247	19.4	8.67	5.82	4.58	3.90	3.47	3.17	2.96	2.80	2.57	2.41	2.30	2.22	2.15	2.10	2.05	2.02	1.99	1.96
20	248	19.4	8.66	5.80	4.56	3.87	3.44	3.15	2.94	2.77	2.54	2.39	2.28	2.19	2.12	2.07	2.03	1.99	1.96	1.93
22	249	19.5	8.65	5.79	4.54	3.86	3.43	3.13	2.92	2.75	2.52	2.37	2.25	2.17	2.10	2.05	2.00	1.97	1.93	1.91
24	249	19.5	8.64	5.77	4.53	3.84	3.41	3.12	2.90	2.74	2.51	2.35	2.24	2.15	2.08	2.03	1.98	1.95	1.91	1.89
26	249	19.5	8.63	5.76	4.52	3.83	3.40	3.10	2.89	2.72	2.49	2.33	2.22	2.13	2.07	2.01	1.97	1.93	1.90	1.87
28	250	19.5	8.62	5.75	4.50	3.82	3.39	3.09	2.87	2.71	2.48	2.32	2.21	2.12	2.05	2.00	1.95	1.91	1.88	1.85
30	250	19.5	8.62	5.75	4.50	3.81	3.38	3.08	2.86	2.70	2.47	2.31	2.19	2.11	2.04	1.98	1.94	1.90	1.87	1.84

Ablesebeispiel: $F_{2;12;0.95} = 3.89$

Approximation für $m > 30$: $F_{m_1;m_2;0.95} = \exp(\frac{3.2897}{\sqrt{h-0.95}} - 1.568g)$ mit $g = \frac{1}{m_1} - \frac{1}{m_2}$ und $h = \frac{2m_1m_2}{m_1+m_2}$

Es gilt $F_{m_1;m_2;1-p} = \frac{1}{F_{m_2;m_1;p}}$.

p-Quantile $F_{m_1;m_2;p=0.975}$:

$m_1 \backslash m_2$	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	24	26	28	30
1	648	38.5	17.4	12.2	10.0	8.81	8.07	7.57	7.21	6.94	6.55	6.30	6.12	5.98	5.87	5.79	5.72	5.66	5.61	5.57
2	799	39.0	16.0	10.6	8.43	7.26	6.54	6.06	5.71	5.46	5.10	4.86	4.69	4.56	4.46	4.38	4.32	4.27	4.22	4.18
3	864	39.2	15.4	9.98	7.76	6.60	5.89	5.42	5.08	4.83	4.47	4.24	4.08	3.95	3.86	3.78	3.72	3.67	3.63	3.59
4	900	39.2	15.1	9.60	7.39	6.23	5.52	5.05	4.72	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.38	3.33	3.29	3.25
5	922	39.3	14.9	9.36	7.15	5.99	5.29	4.82	4.48	4.24	3.89	3.66	3.50	3.38	3.29	3.22	3.15	3.10	3.06	3.03
6	937	39.3	14.7	9.20	6.98	5.82	5.12	4.65	4.32	4.07	3.73	3.50	3.34	3.22	3.13	3.05	2.99	2.94	2.90	2.87
7	948	39.4	14.6	9.07	6.85	5.70	4.99	4.53	4.20	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87	2.82	2.78	2.75
8	957	39.4	14.5	8.98	6.76	5.60	4.90	4.43	4.10	3.85	3.51	3.29	3.12	3.01	2.91	2.84	2.78	2.73	2.69	2.65
9	963	39.4	14.5	8.90	6.68	5.52	4.82	4.36	4.03	3.78	3.44	3.21	3.05	2.93	2.84	2.76	2.70	2.65	2.61	2.57
10	969	39.4	14.4	8.84	6.62	5.46	4.76	4.30	3.96	3.72	3.37	3.15	2.99	2.87	2.77	2.70	2.64	2.59	2.55	2.51
12	977	39.4	14.3	8.75	6.52	5.37	4.67	4.20	3.87	3.62	3.28	3.05	2.89	2.77	2.68	2.60	2.54	2.49	2.45	2.41
14	983	39.4	14.3	8.68	6.46	5.30	4.60	4.13	3.80	3.55	3.21	2.98	2.82	2.70	2.60	2.53	2.47	2.42	2.37	2.34
16	987	39.4	14.2	8.63	6.40	5.24	4.54	4.08	3.74	3.50	3.15	2.92	2.76	2.64	2.55	2.47	2.41	2.36	2.32	2.28
18	990	39.4	14.2	8.59	6.36	5.20	4.50	4.03	3.70	3.45	3.11	2.88	2.72	2.60	2.50	2.43	2.36	2.31	2.27	2.23
20	993	39.4	14.2	8.56	6.33	5.17	4.47	4.00	3.67	3.42	3.07	2.84	2.68	2.56	2.46	2.39	2.33	2.28	2.23	2.20
22	995	39.5	14.1	8.53	6.30	5.14	4.44	3.97	3.64	3.39	3.04	2.81	2.65	2.53	2.43	2.36	2.30	2.24	2.20	2.16
24	997	39.5	14.1	8.51	6.28	5.12	4.41	3.95	3.61	3.37	3.02	2.79	2.63	2.50	2.41	2.33	2.27	2.22	2.17	2.14
26	999	39.5	14.1	8.49	6.26	5.10	4.39	3.93	3.59	3.34	3.00	2.77	2.60	2.48	2.39	2.31	2.25	2.19	2.15	2.11
28	1000	39.5	14.1	8.48	6.24	5.08	4.38	3.91	3.58	3.33	2.98	2.75	2.58	2.46	2.37	2.29	2.23	2.17	2.13	2.09
30	1000	39.5	14.1	8.46	6.23	5.07	4.36	3.89	3.56	3.31	2.96	2.73	2.57	2.44	2.35	2.27	2.21	2.16	2.11	2.07

Ablesebeispiel: $F_{2;12;0.975} = 5.10$

Approximation für $m > 30$: $F_{m_1;m_2;0.95} = \exp(\frac{3.9197}{\sqrt{h-1.14}} - 1.948g)$ mit $g = \frac{1}{m_1} - \frac{1}{m_2}$ und $h = \frac{2m_1m_2}{m_1+m_2}$

Es gilt $F_{m_1;m_2;1-p} = \frac{1}{F_{m_2;m_1;p}}$.