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oft $\Phi(x) (= F(x))$ $P[X \leq x]$



6. Ausgewählte Verteilungen (Distributions)

Werte der Verteilungsfunktion der Standardnormalverteilung $\mathcal{N}(0, 1)$

x	F(x)	x	F(x)	x	F(x)	x	F(x)
-4.00	0.0000	-1.10	0.1357	0.02	0.5080	1.12	0.8686
-3.90	0.0000	-1.08	0.1401	0.04	0.5160	1.14	0.8729
-3.80	0.0001	-1.06	0.1446	0.06	0.5239	1.16	0.8770
-3.70	0.0001	-1.04	0.1492	0.08	0.5319	1.18	0.8810
-3.60	0.0002	-1.02	0.1539	0.10	0.5398	1.20	0.8849
-3.50	0.0002	-1.00	0.1587	0.12	0.5478	1.22	0.8888
-3.40	0.0003	-0.98	0.1635	0.14	0.5557	1.24	0.8925
-3.30	0.0005	-0.96	0.1685	0.16	0.5636	1.26	0.8962
-3.20	0.0007	-0.94	0.1736	0.18	0.5714	1.28	0.8997
-3.10	0.0010	-0.92	0.1788	0.20	0.5793	1.30	0.9032
-3.00	0.0013	-0.90	0.1841	0.22	0.5871	1.32	0.9066
-2.90	0.0019	-0.88	0.1894	0.24	0.5948	1.34	0.9099
-2.80	0.0026	-0.86	0.1949	0.26	0.6026	1.36	0.9131
-2.70	0.0035	-0.84	0.2005	0.28	0.6103	1.38	0.9162
-2.60	0.0047	-0.82	0.2061	0.30	0.6179	1.40	0.9192
-2.50	0.0062	-0.80	0.2119	0.32	0.6255	1.42	0.9222
-2.45	0.0071	-0.78	0.2177	0.34	0.6331	1.44	0.9251
-2.40	0.0082	-0.76	0.2236	0.36	0.6406	1.46	0.9279
-2.35	0.0094	-0.74	0.2296	0.38	0.6480	1.48	0.9306
-2.30	0.0107	-0.72	0.2358	0.40	0.6554	1.50	0.9332
-2.25	0.0122	-0.70	0.2420	0.42	0.6628	1.55	0.9394
-2.20	0.0139	-0.68	0.2483	0.44	0.6700	1.60	0.9452
-2.15	0.0158	-0.66	0.2546	0.46	0.6772	1.65	0.9505
-2.10	0.0179	-0.64	0.2611	0.48	0.6844	1.70	0.9554
-2.05	0.0202	-0.62	0.2676	0.50	0.6915	1.75	0.9599
-2.00	0.0228	-0.60	0.2743	0.52	0.6985	1.80	0.9641
-1.95	0.0256	-0.58	0.2810	0.54	0.7054	1.85	0.9678
-1.90	0.0287	-0.56	0.2877	0.56	0.7123	1.90	0.9713
-1.85	0.0322	-0.54	0.2946	0.58	0.7190	1.95	0.9744
-1.80	0.0359	-0.52	0.3015	0.60	0.7257	2.00	0.9772
-1.75	0.0401	-0.50	0.3085	0.62	0.7324	2.05	0.9798
-1.70	0.0446	-0.48	0.3156	0.64	0.7389	2.10	0.9821
-1.65	0.0495	-0.46	0.3228	0.66	0.7454	2.15	0.9842
-1.60	0.0548	-0.44	0.3300	0.68	0.7517	2.20	0.9861
-1.55	0.0606	-0.42	0.3372	0.70	0.7580	2.25	0.9878
-1.50	0.0668	-0.40	0.3446	0.72	0.7642	2.30	0.9893
-1.48	0.0694	-0.38	0.3520	0.74	0.7704	2.35	0.9906
-1.46	0.0721	-0.36	0.3594	0.76	0.7764	2.40	0.9918
-1.44	0.0749	-0.34	0.3669	0.78	0.7823	2.45	0.9929
-1.42	0.0778	-0.32	0.3745	0.80	0.7881	2.50	0.9938
-1.40	0.0808	-0.30	0.3821	0.82	0.7939	2.60	0.9953
-1.38	0.0838	-0.28	0.3897	0.84	0.7995	2.70	0.9965
-1.36	0.0869	-0.26	0.3974	0.86	0.8051	2.80	0.9974
-1.34	0.0901	-0.24	0.4052	0.88	0.8106	2.90	0.9981
-1.32	0.0934	-0.22	0.4129	0.90	0.8159	3.00	0.9987
-1.30	0.0968	-0.20	0.4207	0.92	0.8212	3.10	0.9990
-1.28	0.1003	-0.18	0.4286	0.94	0.8264	3.20	0.9993
-1.26	0.1038	-0.16	0.4364	0.96	0.8315	3.30	0.9995
-1.24	0.1075	-0.14	0.4443	0.98	0.8365	3.40	0.9997
-1.22	0.1112	-0.12	0.4522	1.00	0.8413	3.50	0.9998
-1.20	0.1151	-0.10	0.4602	1.02	0.8461	3.60	0.9998
-1.18	0.1190	-0.08	0.4681	1.04	0.8508	3.70	0.9999
-1.16	0.1230	-0.06	0.4761	1.06	0.8554	3.80	0.9999
-1.14	0.1271	-0.04	0.4840	1.08	0.8599	3.90	1.0000
-1.12	0.1314	-0.02	0.4920	1.10	0.8643	4.00	1.0000
		0.00	0.5000				

$\lim_{x \rightarrow -\infty} F(x) = 0$

1.28 $\hat{=}$ 90%

1.64 $\hat{=}$ 95%

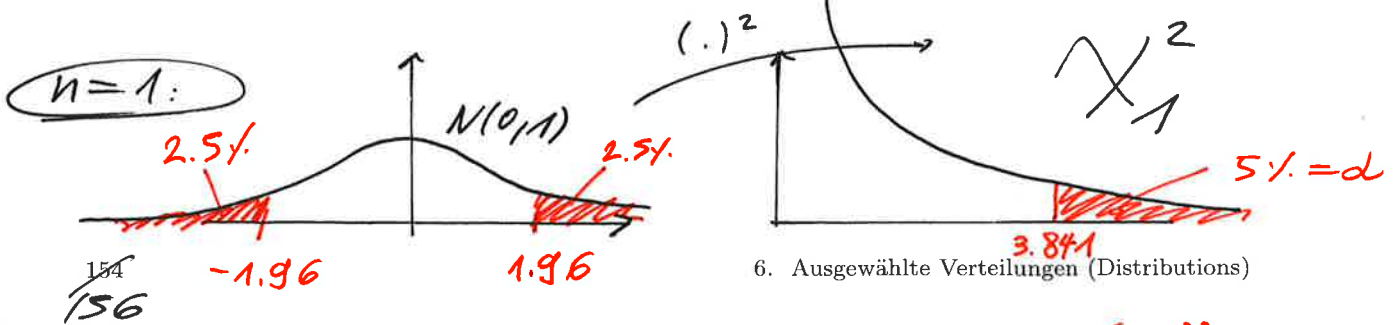
1.96 $\hat{=}$ 97.5%
($\hat{=}$ 2)

2.32 $\hat{=}$ 99%

2.58 $\hat{=}$ 99.5%

$\lim_{x \rightarrow \infty} F(x) = 1$

σ^2 geschätzt? $\Rightarrow t_{n-1}$ statt \mathcal{N} ,
vgl. p. 16



6. Ausgewählte Verteilungen (Distributions)

Kritische Werte der χ_n^2 -Verteilung für ein Signifikanzniveau von α

$(1.96)^2 = 3.841$

$N(0,1)^2 = \chi_1^2$

$df \rightarrow n$	α	0.20	0.10	0.05	0.02	0.01	0.001
1		1.642	2.706	3.841	5.412	6.635	10.828
2		3.219	4.605	5.991	7.824	9.210	13.816
3		4.642	6.251	7.815	9.837	11.345	16.266
4		5.989	7.779	9.488	11.668	13.277	18.467
5		7.289	9.236	11.070	13.388	15.086	20.515
6		8.558	10.645	12.592	15.033	16.812	22.458
7		9.803	12.017	14.067	16.622	18.475	24.322
8		11.030	13.362	15.507	18.168	20.090	26.125
9		12.242	14.684	16.919	19.679	21.666	27.877
10		13.442	15.987	18.307	21.161	23.209	29.588
11		14.631	17.275	19.675	22.618	24.725	31.264
12		15.812	18.549	21.026	24.054	26.217	32.909
13		16.985	19.812	22.362	25.472	27.688	34.528
14		18.151	21.064	23.685	26.873	29.141	36.123
15		19.311	22.307	24.996	28.259	30.578	37.697
16		20.465	23.542	26.296	29.633	32.000	39.252
17		21.615	24.769	27.587	30.995	33.409	40.790
18		22.760	25.989	28.869	32.346	34.805	42.312
19		23.900	27.204	30.144	33.687	36.191	43.820
20		25.038	28.412	31.410	35.020	37.566	45.315
21		26.171	29.615	32.671	36.343	38.932	46.797
22		27.301	30.813	33.924	37.659	40.289	48.268
23		28.429	32.007	35.172	38.968	41.638	49.728
24		29.553	33.196	36.415	40.270	42.980	51.179
25		30.675	34.382	37.652	41.566	44.314	52.620
26		31.795	35.563	38.885	42.856	45.642	54.052
27		32.912	36.741	40.113	44.140	46.963	55.476
28		34.027	37.916	41.337	45.419	48.278	56.892
29		35.139	39.087	42.557	46.693	49.588	58.302
30		36.250	40.256	43.773	47.962	50.892	59.703
40		47.3	51.8	55.8	60.4	63.7	73.4
50		58.2	63.2	67.5	72.6	76.2	86.7
60		69.0	74.4	79.1	84.6	88.4	99.6
80		90.4	96.6	101.9	108.1	112.3	124.8
100		111.7	118.5	124.3	131.1	135.8	149.5
150		164.3	172.6	179.6	187.7	193.2	209.3
200		216.6	226.0	234.0	243.2	249.4	267.6
Z_α		0.842	1.282	1.645	2.054	2.326	3.090

$(df - 1)$

Kritische Werte der $F(m, n)$ -Verteilung für ein Signifikanzniveau von 5%

n	m	1	2	3	4	5	6	7	8	9	10	15	20	30
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	245.9	248.0	250.1	
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.43	19.45	19.46	
3	10.13	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786	8.703	8.660	8.617	
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964	5.858	5.803	5.746	
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735	4.619	4.558	4.496	
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060	3.938	3.874	3.808	
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637	3.511	3.445	3.376	
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347	3.218	3.150	3.079	
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137	3.006	2.936	2.864	
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978	2.845	2.774	2.700	
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854	2.719	2.646	2.570	
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753	2.617	2.544	2.466	
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671	2.533	2.459	2.380	
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602	2.463	2.388	2.308	
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544	2.403	2.328	2.247	
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494	2.352	2.276	2.194	
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450	2.308	2.230	2.148	
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412	2.269	2.191	2.107	
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378	2.234	2.155	2.071	
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348	2.203	2.124	2.039	
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321	2.176	2.096	2.010	
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297	2.151	2.071	1.984	
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275	2.128	2.048	1.961	
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255	2.108	2.027	1.939	
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236	2.089	2.007	1.919	
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220	2.072	1.990	1.901	
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204	2.056	1.974	1.884	
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190	2.041	1.959	1.869	
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177	2.027	1.945	1.854	
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165	2.015	1.932	1.841	
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153	2.003	1.920	1.828	
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142	1.992	1.908	1.817	
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133	1.982	1.898	1.806	
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123	1.972	1.888	1.795	
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114	1.963	1.878	1.786	
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106	1.954	1.870	1.776	
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098	1.946	1.861	1.768	
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091	1.939	1.853	1.760	
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084	1.931	1.846	1.752	
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077	1.924	1.839	1.744	
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071	1.918	1.832	1.737	
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065	1.912	1.826	1.731	
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059	1.906	1.820	1.724	
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054	1.900	1.814	1.718	
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049	1.895	1.808	1.713	
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026	1.871	1.784	1.687	
55	4.016	3.165	2.773	2.540	2.383	2.269	2.181	2.112	2.055	2.008	1.852	1.764	1.666	
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993	1.836	1.748	1.649	
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969	1.812	1.722	1.622	
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951	1.793	1.703	1.602	
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938	1.779	1.688	1.586	
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927	1.768	1.676	1.573	
200	3.888	3.041	2.650	2.417	2.259	2.144	2.056	1.985	1.927	1.878	1.717	1.623	1.516	
400	3.865	3.018	2.627	2.394	2.237	2.121	2.032	1.962	1.903	1.854	1.691	1.597	1.488	
500	3.860	3.014	2.623	2.390	2.232	2.117	2.028	1.957	1.899	1.850	1.686	1.592	1.482	
1000	3.851	3.005	2.614	2.381	2.223	2.108	2.019	1.948	1.889	1.840	1.676	1.581	1.471	

Nennz

(Zähler)

$A = \text{latenz}$

$$F_{k-1, n-k}$$

Kritische Werte der t_n -Verteilung für ein Signifikanzniveau von α

n	α	0.20	0.10	0.05	0.02	0.01	0.001
1		3.078	6.314	12.706	31.821	63.657	636.619
2		1.886	2.920	4.303	6.965	9.925	31.598
3		1.638	2.353	3.182	4.541	5.841	12.924
4		1.533	2.132	2.776	3.747	4.604	8.610
5		1.476	2.015	2.571	3.365	4.032	6.869
6		1.440	1.943	2.447	3.143	3.707	5.959
7		1.415	1.895	2.365	2.998	3.499	5.408
8		1.397	1.860	2.306	2.896	3.355	5.041
9		1.383	1.833	2.262	2.821	3.250	4.781
10		1.372	1.812	2.228	2.764	3.169	4.587
11		1.363	1.796	2.201	2.718	3.106	4.437
12		1.356	1.782	2.179	2.681	3.055	4.318
13		1.350	1.771	2.160	2.650	3.012	4.221
14		1.345	1.761	2.145	2.624	2.977	4.140
15		1.341	1.753	2.131	2.602	2.947	4.073
16		1.337	1.746	2.120	2.583	2.921	4.015
17		1.333	1.740	2.110	2.567	2.898	3.965
18		1.330	1.734	2.101	2.552	2.878	3.922
19		1.328	1.729	2.093	2.539	2.861	3.883
20		1.325	1.725	2.086	2.528	2.845	3.850
21		1.323	1.721	2.080	2.518	2.831	3.819
22		1.321	1.717	2.074	2.508	2.819	3.792
23		1.319	1.714	2.069	2.500	2.807	3.767
24		1.318	1.711	2.064	2.492	2.797	3.745
25		1.316	1.708	2.060	2.485	2.787	3.725
26		1.315	1.706	2.056	2.479	2.779	3.707
27		1.314	1.703	2.052	2.473	2.771	3.690
28		1.313	1.701	2.048	2.467	2.763	3.674
29		1.311	1.699	2.045	2.462	2.756	3.659
30		1.310	1.697	2.042	2.457	2.750	3.646
35		1.306	1.690	2.030	2.438	2.724	3.591
40		1.303	1.684	2.021	2.423	2.704	3.551
45		1.301	1.679	2.014	2.412	2.690	3.520
50		1.299	1.676	2.009	2.403	2.678	3.496
60		1.296	1.671	2.000	2.390	2.660	3.460
70		1.294	1.667	1.994	2.381	2.648	3.435
80		1.292	1.664	1.990	2.374	2.639	3.416
90		1.291	1.662	1.987	2.368	2.632	3.402
100		1.290	1.660	1.984	2.364	2.626	3.390
1000		1.282	1.645	1.962	2.330	2.581	3.300
∞		1.282	1.645	1.960	2.326	2.576	3.291
*		0.10	0.05	0.025	0.01	0.005	0.0005

← 2-seitig & u.l.

← $N(0,1)$

← einseitig

*: Signifikanzschwellen für den einseitigen Test.

o df - 1
o α^2 geteilt $\Rightarrow t_{n-1}$ statt N , vgl. p-6