

Mathematik-Formelsammlung

> Statistik

> Normalverteilung $N(0,1)$

> Wahrscheinlichkeitstafel

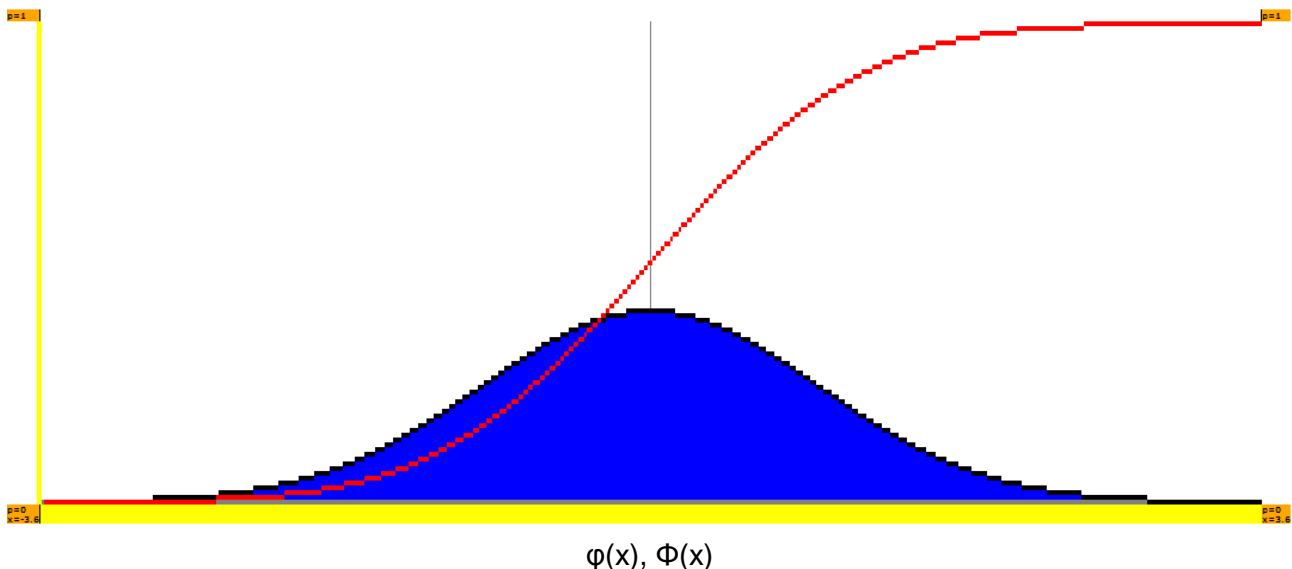
(Stetige) Häufigkeitsverteilungen von stochastischen Zufallsvariablen X genügen der Normalverteilung $N(\mu, \sigma^2)$ mit Erwartungswert μ und Standardabweichung σ , wobei für die Standardnormalverteilung $N(0,1)$ (Erwartungswert $\mu=0$, Standardabweichung $\sigma=1$) gilt:

$$\text{Dichtefunktion: } \varphi(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}, \text{ Verteilungsfunktion: } \Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-t^2/2} dt$$

und für die allgemeine Dichtefunktion $f(x)$ und Verteilungsfunktion $F(x)$ der $N(\mu, \sigma^2)$ -verteilten Zufallsvariablen:

$$\begin{aligned} \text{Dichtefunktion } f(x) &= \frac{1}{\sigma} \cdot \varphi\left(\frac{x-\mu}{\sigma}\right), \\ \text{Verteilungsfunktion } p(X \leq x) = F(x) &= \Phi\left(\frac{x-\mu}{\sigma}\right) \end{aligned}$$

d.h.: jede normalverteilte Zufallsvariable lässt sich auf die Standardnormalverteilung zurückführen:



Die nichtnegative bzw. positive Dichtefunktion ist stetig mit: $f(-\infty) = f(\infty) = 0$, die Verteilungsfunktion ist die Stammfunktion der Dichtefunktion mit: $F(-\infty) = 0$, $F(\infty) = 1$, $F(\mu) = 0,5$. Schließlich ist x_α das α -Quantil der stetigen Normalverteilungsfunktion mit: $F(x_\alpha) = \alpha$ bzw. $x_\alpha = F^{-1}(\alpha)$. Quantile der Standardnormalverteilung $N(0,1)$ werden mit u_α bezeichnet und sind nachfolgend tabelliert.

Normalverteilung N(0,1)											
x Φ(x)	_9	_8	_7	_6	_5	_4	_3	_2	_1	_0	x Φ(x)
-3.5_	0.000115	0.000127	0.000139	0.000150	0.000162	0.000173	0.000183	0.000194	0.000205	0.000216	-3.5_
-3.4_	0.000227	0.000237	0.000248	0.000260	0.000271	0.000283	0.000295	0.000307	0.000319	0.000332	-3.4_
-3.3_	0.000345	0.000359	0.000372	0.000387	0.000401	0.000417	0.000432	0.000448	0.000465	0.000482	-3.3_
-3.2_	0.000500	0.000518	0.000537	0.000556	0.000576	0.000597	0.000618	0.000640	0.000663	0.000687	-3.2_
-3.1_	0.000711	0.000736	0.000762	0.000789	0.000816	0.000845	0.000874	0.000904	0.000935	0.000968	-3.1_
-3.0_	0.001001	0.001035	0.001070	0.001107	0.001144	0.001183	0.001223	0.001264	0.001306	0.001350	-3.0_
-2.9_	0.001395	0.001441	0.001489	0.001538	0.001589	0.001641	0.001695	0.001750	0.001807	0.001866	-2.9_
-2.8_	0.001926	0.001988	0.002052	0.002118	0.002186	0.002256	0.002327	0.002401	0.002477	0.002555	-2.8_
-2.7_	0.002635	0.002718	0.002803	0.002890	0.002980	0.003072	0.003167	0.003264	0.003364	0.003467	-2.7_
-2.6_	0.003573	0.003681	0.003793	0.003907	0.004025	0.004145	0.004269	0.004396	0.004527	0.004661	-2.6_
-2.5_	0.004799	0.004940	0.005085	0.005234	0.005386	0.005543	0.005703	0.005868	0.006037	0.006210	-2.5_
-2.4_	0.006387	0.006569	0.006756	0.006947	0.007143	0.007344	0.007549	0.007760	0.007976	0.008198	-2.4_
-2.3_	0.008424	0.008656	0.008894	0.009137	0.009387	0.009642	0.009903	0.010170	0.010444	0.010724	-2.3_
-2.2_	0.011011	0.011304	0.011604	0.011911	0.012224	0.012545	0.012874	0.013209	0.013553	0.013903	-2.2_
-2.1_	0.014262	0.014629	0.015003	0.015386	0.015778	0.016177	0.016586	0.017003	0.017429	0.017864	-2.1_
-2.0_	0.018309	0.018763	0.019226	0.019699	0.020182	0.020675	0.021178	0.021692	0.022216	0.022750	-2.0_
-1.9_	0.023295	0.023852	0.024419	0.024998	0.025588	0.026190	0.026803	0.027429	0.028067	0.028717	-1.9_
-1.8_	0.029379	0.030054	0.030742	0.031443	0.032157	0.032884	0.033625	0.034380	0.035148	0.035930	-1.8_
-1.7_	0.036727	0.037538	0.038364	0.039204	0.040059	0.040930	0.041815	0.042716	0.043633	0.044565	-1.7_
-1.6_	0.045514	0.046479	0.047460	0.048457	0.049471	0.050503	0.051551	0.052616	0.053699	0.054799	-1.6_
-1.5_	0.055917	0.057053	0.058208	0.059380	0.060571	0.061780	0.063008	0.064255	0.065522	0.066807	-1.5_
-1.4_	0.068112	0.069437	0.070781	0.072145	0.073529	0.074934	0.076359	0.077804	0.079270	0.080757	-1.4_
-1.3_	0.082264	0.083793	0.085343	0.086915	0.088508	0.090123	0.091759	0.093418	0.095098	0.096800	-1.3_
-1.2_	0.098525	0.100273	0.102042	0.103835	0.105650	0.107488	0.109349	0.111232	0.113139	0.115070	-1.2_
-1.1_	0.117023	0.119000	0.121000	0.123024	0.125072	0.127143	0.129238	0.131357	0.133500	0.135666	-1.1_
-1.0_	0.137857	0.140071	0.142310	0.144572	0.146859	0.149170	0.151505	0.153864	0.156248	0.158655	-1.0_
-0.9_	0.161087	0.163543	0.166023	0.168528	0.171056	0.173609	0.176186	0.178786	0.181411	0.184060	-0.9_
-0.8_	0.186733	0.189430	0.192150	0.194895	0.197663	0.200454	0.203269	0.206108	0.208970	0.211855	-0.8_
-0.7_	0.214764	0.217695	0.220650	0.223627	0.226627	0.229650	0.232695	0.235762	0.238852	0.241964	-0.7_
-0.6_	0.245097	0.248252	0.251429	0.254627	0.257846	0.261086	0.264347	0.267629	0.270931	0.274253	-0.6_
-0.5_	0.277595	0.280957	0.284339	0.287740	0.291160	0.294599	0.298056	0.301532	0.305026	0.308538	-0.5_
-0.4_	0.312067	0.315614	0.319178	0.322758	0.326355	0.329969	0.333598	0.337243	0.340903	0.344578	-0.4_
-0.3_	0.348268	0.351973	0.355691	0.359424	0.363169	0.366928	0.370700	0.374484	0.378280	0.382089	-0.3_
-0.2_	0.385908	0.389739	0.393580	0.397432	0.401294	0.405165	0.409046	0.412936	0.416834	0.420740	-0.2_
-0.1_	0.424655	0.428576	0.432505	0.436441	0.440382	0.444330	0.448283	0.452242	0.456205	0.460172	-0.1_
-0.0_	0.464144	0.468119	0.472097	0.476078	0.480061	0.484047	0.488034	0.492022	0.496011	0.500000	-0.0_
x Φ(x)	_9	_8	_7	_6	_5	_4	_3	_2	_1	_0	x Φ(x)

$x \Phi(x)$	_0	_1	_2	_3	_4	_5	_6	_7	_8	_9	$x \Phi(x)$
0.0_	0.500000	0.503989	0.507978	0.511966	0.515953	0.519939	0.523922	0.527903	0.531881	0.535856	0.0_
0.1_	0.539828	0.543795	0.547758	0.551717	0.555670	0.559618	0.563559	0.567495	0.571424	0.575345	0.1_
0.2_	0.579260	0.583166	0.587064	0.590954	0.594835	0.598706	0.602568	0.606420	0.610261	0.614092	0.2_
0.3_	0.617911	0.621720	0.625516	0.629300	0.633072	0.636831	0.640576	0.644309	0.648027	0.651732	0.3_
0.4_	0.655422	0.659097	0.662757	0.666402	0.670031	0.673645	0.677242	0.680822	0.684386	0.687933	0.4_
0.5_	0.691462	0.694974	0.698468	0.701944	0.705401	0.708840	0.712260	0.715661	0.719043	0.722405	0.5_
0.6_	0.725747	0.729069	0.732371	0.735653	0.738914	0.742154	0.745373	0.748571	0.751748	0.754903	0.6_
0.7_	0.758036	0.761148	0.764238	0.767305	0.770350	0.773373	0.776373	0.779350	0.782305	0.785236	0.7_
0.8_	0.788145	0.791030	0.793892	0.796731	0.799546	0.802337	0.805105	0.807850	0.810570	0.813267	0.8_
0.9_	0.815940	0.818589	0.821214	0.823814	0.826391	0.828944	0.831472	0.833977	0.836457	0.838913	0.9_
1.0_	0.841345	0.843752	0.846136	0.848495	0.850830	0.853141	0.855428	0.857690	0.859929	0.862143	1.0_
1.1_	0.864334	0.866500	0.868643	0.870762	0.872857	0.874928	0.876976	0.879000	0.881000	0.882977	1.1_
1.2_	0.884930	0.886861	0.888768	0.890651	0.892512	0.894350	0.896165	0.897958	0.899727	0.901475	1.2_
1.3_	0.903200	0.904902	0.906582	0.908241	0.909877	0.911492	0.913085	0.914657	0.916207	0.917736	1.3_
1.4_	0.919243	0.920730	0.922196	0.923641	0.925066	0.926471	0.927855	0.929219	0.930563	0.931888	1.4_
1.5_	0.933193	0.934478	0.935745	0.936992	0.938220	0.939429	0.940620	0.941792	0.942947	0.944083	1.5_
1.6_	0.945201	0.946301	0.947384	0.948449	0.949497	0.950529	0.951543	0.952540	0.953521	0.954486	1.6_
1.7_	0.955435	0.956367	0.957284	0.958185	0.959070	0.959941	0.960796	0.961636	0.962462	0.963273	1.7_
1.8_	0.964070	0.964852	0.965620	0.966375	0.967116	0.967843	0.968557	0.969258	0.969946	0.970621	1.8_
1.9_	0.971283	0.971933	0.972571	0.973197	0.973810	0.974412	0.975002	0.975581	0.976148	0.976705	1.9_
2.0_	0.977250	0.977784	0.978308	0.978822	0.979325	0.979818	0.980301	0.980774	0.981237	0.981691	2.0_
2.1_	0.982136	0.982571	0.982997	0.983414	0.983823	0.984222	0.984614	0.984997	0.985371	0.985738	2.1_
2.2_	0.986097	0.986447	0.986791	0.987126	0.987455	0.987776	0.988089	0.988396	0.988696	0.988989	2.2_
2.3_	0.989276	0.989556	0.989830	0.990097	0.990358	0.990613	0.990863	0.991106	0.991344	0.991576	2.3_
2.4_	0.991802	0.992024	0.992240	0.992451	0.992656	0.992857	0.993053	0.993244	0.993431	0.993613	2.4_
2.5_	0.993790	0.993963	0.994132	0.994297	0.994457	0.994614	0.994766	0.994915	0.995060	0.995201	2.5_
2.6_	0.995339	0.995473	0.995604	0.995731	0.995855	0.995975	0.996093	0.996207	0.996319	0.996427	2.6_
2.7_	0.996533	0.996636	0.996736	0.996833	0.996928	0.997020	0.997110	0.997197	0.997282	0.997365	2.7_
2.8_	0.997445	0.997523	0.997599	0.997673	0.997744	0.997814	0.997882	0.997948	0.998012	0.998074	2.8_
2.9_	0.998134	0.998193	0.998250	0.998305	0.998359	0.998411	0.998462	0.998511	0.998559	0.998605	2.9_
3.0_	0.998650	0.998694	0.998736	0.998777	0.998817	0.998856	0.998893	0.998930	0.998965	0.998999	3.0_
3.1_	0.999032	0.999065	0.999096	0.999126	0.999155	0.999184	0.999211	0.999238	0.999264	0.999289	3.1_
3.2_	0.999313	0.999337	0.999360	0.999382	0.999403	0.999424	0.999444	0.999463	0.999482	0.999500	3.2_
3.3_	0.999518	0.999535	0.999552	0.999568	0.999583	0.999599	0.999613	0.999628	0.999641	0.999655	3.3_
3.4_	0.999668	0.999681	0.999693	0.999705	0.999717	0.999729	0.999740	0.999752	0.999763	0.999773	3.4_
3.5_	0.999784	0.999795	0.999806	0.999817	0.999827	0.999838	0.999850	0.999861	0.999873	0.999885	3.5_
$x \Phi(x)$	_0	_1	_2	_3	_4	_5	_6	_7	_8	_9	$x \Phi(x)$

Normalverteilung N(0,1)