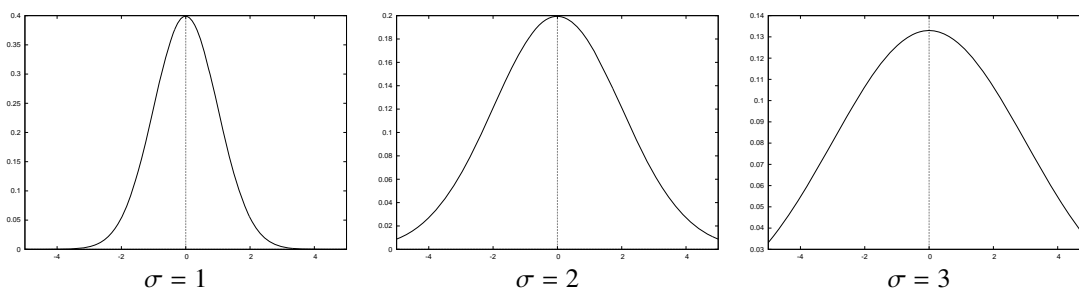


$$f_{\sigma}(z) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{1}{2}\left(\frac{z}{\sigma}\right)^2\right\}$$



確率変数 X が平均 m で標準偏差 σ (分散 σ^2) の正規分布に従うとは

$$P(a \leq X - m \leq b) = \int_a^b f_{\sigma}(z) dz$$

となることをいう。 $\sigma = 1$ のときは標準正規分布に従うという。 $\frac{X - m}{\sigma}$ は標準正規分布に従う。

$$\int_x^{\infty} f_{\sigma}(z) dz = \alpha$$

となる点 x を標準偏差 σ の正規分布の 100α パーセント点と呼ぶ。

$$\int_{\{|z| \geq x\}} f_{\sigma}(z) dz = 2\alpha$$

を両側 100α パーセント点と呼ぶ。例えば、

- 標準正規分布の 10% 点は 1.2816 :

$$\int_{1.2816}^{\infty} f_1(z) dz = 0.10$$

- 標準正規分布の両側 5% 点は 1.9600 :

$$\int_{\{|z| \geq 1.9600\}} f_1(z) dz = 0.05$$

である。

Maxima:

```
load(distrib);
```

```
quantile_normal(1 - \alpha, m, \sigma), numer;
```

α	0.400	0.300	0.200	0.100	0.050	0.025	0.010	0.005	0.001
2α	0.800	0.600	0.400	0.200	0.100	0.050	0.020	0.010	0.002
0.10	0.0253	0.0524	0.0842	0.1282	0.1645	0.1960	0.2326	0.2576	0.3090
0.20	0.0507	0.1049	0.1683	0.2563	0.3290	0.3920	0.4653	0.5152	0.6180
0.30	0.0760	0.1573	0.2525	0.3845	0.4935	0.5880	0.6979	0.7727	0.9271
0.40	0.1013	0.2098	0.3366	0.5126	0.6579	0.7840	0.9305	1.0303	1.2361
0.50	0.1267	0.2622	0.4208	0.6408	0.8224	0.9800	1.1632	1.2879	1.5451
0.60	0.1520	0.3146	0.5050	0.7689	0.9869	1.1760	1.3958	1.5455	1.8541
0.70	0.1773	0.3671	0.5891	0.8971	1.1514	1.3720	1.6284	1.8031	2.1632
0.80	0.2027	0.4195	0.6733	1.0252	1.3159	1.5680	1.8611	2.0607	2.4722
0.90	0.2280	0.4720	0.7575	1.1534	1.4804	1.7640	2.0937	2.3182	2.7812
1.00	0.2533	0.5244	0.8416	1.2816	1.6449	1.9600	2.3263	2.5758	3.0902
1.10	0.2787	0.5768	0.9258	1.4097	1.8093	2.1560	2.5590	2.8334	3.3993
1.20	0.3040	0.6293	1.0099	1.5379	1.9738	2.3520	2.7916	3.0910	3.7083
1.30	0.3294	0.6817	1.0941	1.6660	2.1383	2.5480	3.0243	3.3486	4.0173
1.40	0.3547	0.7342	1.1783	1.7942	2.3028	2.7439	3.2569	3.6062	4.3263
1.50	0.3800	0.7866	1.2624	1.9223	2.4673	2.9399	3.4895	3.8637	4.6353
1.60	0.4054	0.8390	1.3466	2.0505	2.6318	3.1359	3.7222	4.1213	4.9444
1.70	0.4307	0.8915	1.4308	2.1786	2.7963	3.3319	3.9548	4.3789	5.2534
1.80	0.4560	0.9439	1.5149	2.3068	2.9607	3.5279	4.1874	4.6365	5.5624
1.90	0.4814	0.9964	1.5991	2.4349	3.1252	3.7239	4.4201	4.8941	5.8714
2.00	0.5067	1.0488	1.6832	2.5631	3.2897	3.9199	4.6527	5.1517	6.1805
2.10	0.5320	1.1012	1.7674	2.6913	3.4542	4.1159	4.8853	5.4092	6.4895
2.20	0.5574	1.1537	1.8516	2.8194	3.6187	4.3119	5.1180	5.6668	6.7985
2.30	0.5827	1.2061	1.9357	2.9476	3.7832	4.5079	5.3506	5.9244	7.1075
2.40	0.6080	1.2586	2.0199	3.0757	3.9476	4.7039	5.5832	6.1820	7.4166
2.50	0.6334	1.3110	2.1041	3.2039	4.1121	4.8999	5.8159	6.4396	7.7256
2.60	0.6587	1.3634	2.1882	3.3320	4.2766	5.0959	6.0485	6.6972	8.0346
2.70	0.6840	1.4159	2.2724	3.4602	4.4411	5.2919	6.2811	6.9547	8.3436
2.80	0.7094	1.4683	2.3565	3.5883	4.6056	5.4879	6.5138	7.2123	8.6527
2.90	0.7347	1.5208	2.4407	3.7165	4.7701	5.6839	6.7464	7.4699	8.9617
3.00	0.7600	1.5732	2.5249	3.8447	4.9346	5.8799	6.9790	7.7275	9.2707
3.10	0.7854	1.6256	2.6090	3.9728	5.0990	6.0759	7.2117	7.9851	9.5797
3.20	0.8107	1.6781	2.6932	4.1010	5.2635	6.2719	7.4443	8.2427	9.8887
3.30	0.8360	1.7305	2.7774	4.2291	5.4280	6.4679	7.6769	8.5002	10.1978
3.40	0.8614	1.7830	2.8615	4.3573	5.5925	6.6639	7.9096	8.7578	10.5068
3.50	0.8867	1.8354	2.9457	4.4854	5.7570	6.8599	8.1422	9.0154	10.8158
3.60	0.9120	1.8878	3.0298	4.6136	5.9215	7.0559	8.3749	9.2730	11.1248
3.70	0.9374	1.9403	3.1140	4.7417	6.0860	7.2519	8.6075	9.5306	11.4339
3.80	0.9627	1.9927	3.1982	4.8699	6.2504	7.4479	8.8401	9.7882	11.7429

α	0.400	0.300	0.200	0.100	0.050	0.025	0.010	0.005	0.001
2α	0.800	0.600	0.400	0.200	0.100	0.050	0.020	0.010	0.002
3.90	0.9881	2.0452	3.2823	4.9981	6.4149	7.6439	9.0728	10.0457	12.0519
4.00	1.0134	2.0976	3.3665	5.1262	6.5794	7.8399	9.3054	10.3033	12.3609
4.10	1.0387	2.1500	3.4506	5.2544	6.7439	8.0359	9.5380	10.5609	12.6700
4.20	1.0641	2.2025	3.5348	5.3825	6.9084	8.2318	9.7707	10.8185	12.9790
4.30	1.0894	2.2549	3.6190	5.5107	7.0729	8.4278	10.0033	11.0761	13.2880
4.40	1.1147	2.3074	3.7031	5.6388	7.2374	8.6238	10.2359	11.3336	13.5970
4.50	1.1401	2.3598	3.7873	5.7670	7.4018	8.8198	10.4686	11.5912	13.9060
4.60	1.1654	2.4122	3.8715	5.8951	7.5663	9.0158	10.7012	11.8488	14.2151
4.70	1.1907	2.4647	3.9556	6.0233	7.7308	9.2118	10.9338	12.1064	14.5241
4.80	1.2161	2.5171	4.0398	6.1514	7.8953	9.4078	11.1665	12.3640	14.8331
4.90	1.2414	2.5696	4.1239	6.2796	8.0598	9.6038	11.3991	12.6216	15.1421
5.00	1.2667	2.6220	4.2081	6.4078	8.2243	9.7998	11.6317	12.8791	15.4512
5.10	1.2921	2.6744	4.2923	6.5359	8.3888	9.9958	11.8644	13.1367	15.7602
5.20	1.3174	2.7269	4.3764	6.6641	8.5532	10.1918	12.0970	13.3943	16.0692
5.30	1.3427	2.7793	4.4606	6.7922	8.7177	10.3878	12.3296	13.6519	16.3782
5.40	1.3681	2.8318	4.5448	6.9204	8.8822	10.5838	12.5623	13.9095	16.6873
5.50	1.3934	2.8842	4.6289	7.0485	9.0467	10.7798	12.7949	14.1671	16.9963
5.60	1.4187	2.9366	4.7131	7.1767	9.2112	10.9758	13.0275	14.4246	17.3053
5.70	1.4441	2.9891	4.7972	7.3048	9.3757	11.1718	13.2602	14.6822	17.6143
5.80	1.4694	3.0415	4.8814	7.4330	9.5402	11.3678	13.4928	14.9398	17.9233
5.90	1.4947	3.0940	4.9656	7.5612	9.7046	11.5638	13.7255	15.1974	18.2324
6.00	1.5201	3.1464	5.0497	7.6893	9.8691	11.7598	13.9581	15.4550	18.5414
6.10	1.5454	3.1988	5.1339	7.8175	10.0336	11.9558	14.1907	15.7126	18.8504
6.20	1.5708	3.2513	5.2181	7.9456	10.1981	12.1518	14.4234	15.9701	19.1594
6.30	1.5961	3.3037	5.3022	8.0738	10.3626	12.3478	14.6560	16.2277	19.4685
6.40	1.6214	3.3562	5.3864	8.2019	10.5271	12.5438	14.8886	16.4853	19.7775
6.50	1.6468	3.4086	5.4705	8.3301	10.6915	12.7398	15.1213	16.7429	20.0865
6.60	1.6721	3.4610	5.5547	8.4582	10.8560	12.9358	15.3539	17.0005	20.3955
6.70	1.6974	3.5135	5.6389	8.5864	11.0205	13.1318	15.5865	17.2581	20.7046
6.80	1.7228	3.5659	5.7230	8.7146	11.1850	13.3278	15.8192	17.5156	21.0136
6.90	1.7481	3.6184	5.8072	8.8427	11.3495	13.5238	16.0518	17.7732	21.3226
7.00	1.7734	3.6708	5.8913	8.9709	11.5140	13.7197	16.2844	18.0308	21.6316
7.10	1.7988	3.7232	5.9755	9.0990	11.6785	13.9157	16.5171	18.2884	21.9406
7.20	1.8241	3.7757	6.0597	9.2272	11.8429	14.1117	16.7497	18.5460	22.2497
7.30	1.8494	3.8281	6.1438	9.3553	12.0074	14.3077	16.9823	18.8036	22.5587
7.40	1.8748	3.8806	6.2280	9.4835	12.1719	14.5037	17.2150	19.0611	22.8677
7.50	1.9001	3.9330	6.3122	9.6116	12.3364	14.6997	17.4476	19.3187	23.1767
7.60	1.9254	3.9854	6.3963	9.7398	12.5009	14.8957	17.6802	19.5763	23.4858

α	0.400	0.300	0.200	0.100	0.050	0.025	0.010	0.005	0.001
2α	0.800	0.600	0.400	0.200	0.100	0.050	0.020	0.010	0.002
7.70	1.9508	4.0379	6.4805	9.8679	12.6654	15.0917	17.9129	19.8339	23.7948
7.80	1.9761	4.0903	6.5646	9.9961	12.8299	15.2877	18.1455	20.0915	24.1038
7.90	2.0014	4.1428	6.6488	10.1243	12.9943	15.4837	18.3781	20.3491	24.4128
8.00	2.0268	4.1952	6.7330	10.2524	13.1588	15.6797	18.6108	20.6066	24.7219
8.10	2.0521	4.2476	6.8171	10.3806	13.3233	15.8757	18.8434	20.8642	25.0309
8.20	2.0774	4.3001	6.9013	10.5087	13.4878	16.0717	19.0761	21.1218	25.3399
8.30	2.1028	4.3525	6.9855	10.6369	13.6523	16.2677	19.3087	21.3794	25.6489
8.40	2.1281	4.4050	7.0696	10.7650	13.8168	16.4637	19.5413	21.6370	25.9580
8.50	2.1535	4.4574	7.1538	10.8932	13.9813	16.6597	19.7740	21.8945	26.2670
8.60	2.1788	4.5098	7.2379	11.0213	14.1457	16.8557	20.0066	22.1521	26.5760
8.70	2.2041	4.5623	7.3221	11.1495	14.3102	17.0517	20.2392	22.4097	26.8850
8.80	2.2295	4.6147	7.4063	11.2777	14.4747	17.2477	20.4719	22.6673	27.1940
8.90	2.2548	4.6672	7.4904	11.4058	14.6392	17.4437	20.7045	22.9249	27.5031
9.00	2.2801	4.7196	7.5746	11.5340	14.8037	17.6397	20.9371	23.1825	27.8121
9.10	2.3055	4.7720	7.6588	11.6621	14.9682	17.8357	21.1698	23.4400	28.1211
9.20	2.3308	4.8245	7.7429	11.7903	15.1327	18.0317	21.4024	23.6976	28.4301
9.30	2.3561	4.8769	7.8271	11.9184	15.2971	18.2277	21.6350	23.9552	28.7392
9.40	2.3815	4.9294	7.9112	12.0466	15.4616	18.4237	21.8677	24.2128	29.0482
9.50	2.4068	4.9818	7.9954	12.1747	15.6261	18.6197	22.1003	24.4704	29.3572
9.60	2.4321	5.0342	8.0796	12.3029	15.7906	18.8157	22.3329	24.7280	29.6662
9.70	2.4575	5.0867	8.1637	12.4311	15.9551	19.0117	22.5656	24.9855	29.9753
9.80	2.4828	5.1391	8.2479	12.5592	16.1196	19.2076	22.7982	25.2431	30.2843
9.90	2.5081	5.1916	8.3321	12.6874	16.2841	19.4036	23.0308	25.5007	30.5933

この表は試験時に持参してかまいません。