

# 淡江大學八十九學年度日間部轉學生招生考試試題

67

系別：統計學系三年級 科目：統計學

本試題共 2 頁 P1

一. (16%) 設  $X_1, X_2, \dots, X_n$  為自常態母體  $N(\mu, \sigma^2)$  抽出的一組隨機樣本, 且  $\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$ ,  $S^2 = \frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}$ . 試寫出下列各隨機變數  $Y$  所對應的分配名稱及其相關參數值:

(a)  $Y = \frac{(n-1)S^2}{\sigma^2}$ , (b)  $\frac{n(\bar{X}-\mu)^2}{S^2}$ , (c)  $\frac{\sqrt{n}(\bar{X}-\mu)}{S}$ , (d)  $\frac{n(\bar{X}-\mu)^2}{\sigma^2}$ .

二. (20%) 設  $X_1, X_2, \dots, X_{10}$  為自母體  $N(\mu_1, \sigma_1^2)$  抽出之一組隨機樣本;  $Y_1, Y_2, \dots, Y_{10}$  為另一獨立母體  $N(\mu_2, \sigma_2^2)$  抽出之隨機樣本, 且  $\mu_1, \mu_2, \sigma_1^2, \sigma_2^2$  均未知. 若已知  $\bar{x} = 4.8$ ,  $\bar{y} = 5.6$ ,  $S_1^2 = 9.22$ ,  $S_2^2 = 8.75$ . (分別為樣本平均數與樣本變異數).

(a) 試檢定假設  $H_0: \sigma_1^2 = \sigma_2^2$  v.s.  $H_1: \sigma_1^2 > \sigma_2^2$ , (取顯著水準  $\alpha = 0.01$ ).

(b) 依(a)之結果, 檢定  $H_0: \mu_1 = \mu_2$ , v.s.  $H_1: \mu_1 \neq \mu_2$ . (取  $\alpha = 0.05$ ).

三. (20%) 某公司為調查其產品在 A, B, C 三家超市的銷售量之差異, 而分別由都會區、城市及鄉鎮各隨機抽出一家以檢定銷售量是否相同, 得資料如下表:

超市 \ 區域	都會	城市	鄉鎮
A	51	50	45
B	68	52	49
C	57	47	46

(a) 試列出變異數分析 (ANOVA) 表, 並分別檢定

(1) 不同的超市及 (2) 不同區域, 是否影響該產品的銷售量? (取  $\alpha = 0.01$ ).

(b) 進行以上分析時, 須有那些假設條件?

四. (15%) 設某公司調查了 398 位員工的婚姻狀況與離職意願的資料如下:

離職意願	婚姻狀況		Total
	未婚	已婚	
低	80	61	141
中	94	24	118
高	108	31	139
Total	282	116	398

試檢定此公司員工之婚姻狀況與離職意願是否有關? (取顯著水準  $\alpha = 0.05$ ).

五. (20%) 為判斷, A 快速公司所傳送的平均時間是否較 B 快速公司為長?, 經觀測 55 件由 A 公司傳送及 58 件由 B 公司傳送之時間, 並求得其樣本平均數與標準差如下:

	平均數	標準差
A 公司	5.64	1.25
B 公司	5.03	1.82

(a) 試依檢定步驟檢定之. (取  $\alpha = 0.1$ )

(b) 若欲使總樣本數  $n_A + n_B$  最小, 且以樣本平均數之差  $\bar{x}_A - \bar{x}_B$  估計母體平均數差異  $\mu_A - \mu_B$  的最大誤差為 0.2 且可靠度為 90%, 則  $n_A$  及  $n_B$  分別為多少?

六. 試解釋下列各專有名詞:

(9%) (a) 變異係數 (coefficient of variation).

(b) 顯著水準 (significance level).

(c) 檢定力 (power).

※ 附表在次頁

◀ 注意背面尚有試題 ▶

本試題雙面印製



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本試題共 2 頁

附表：

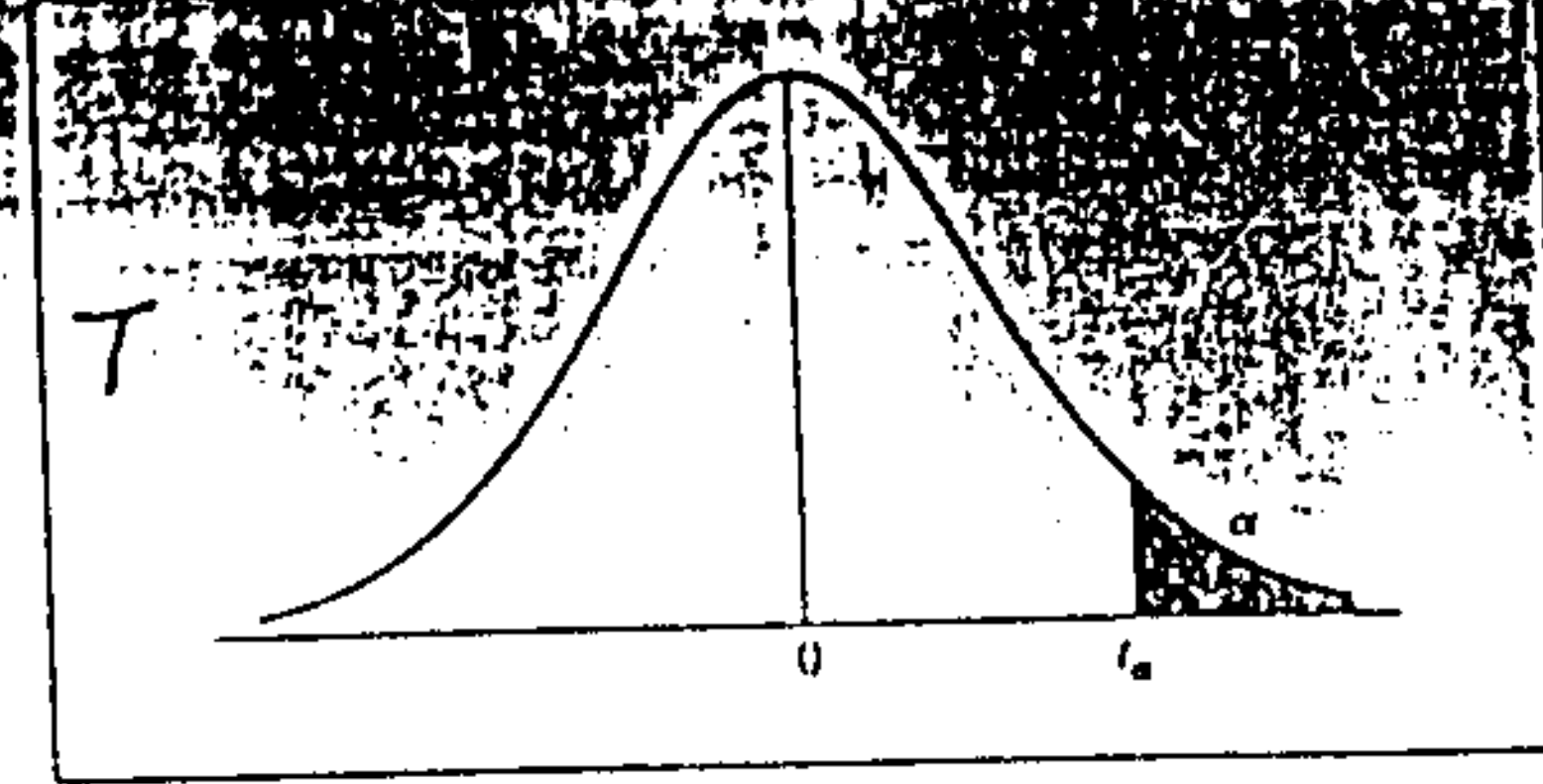
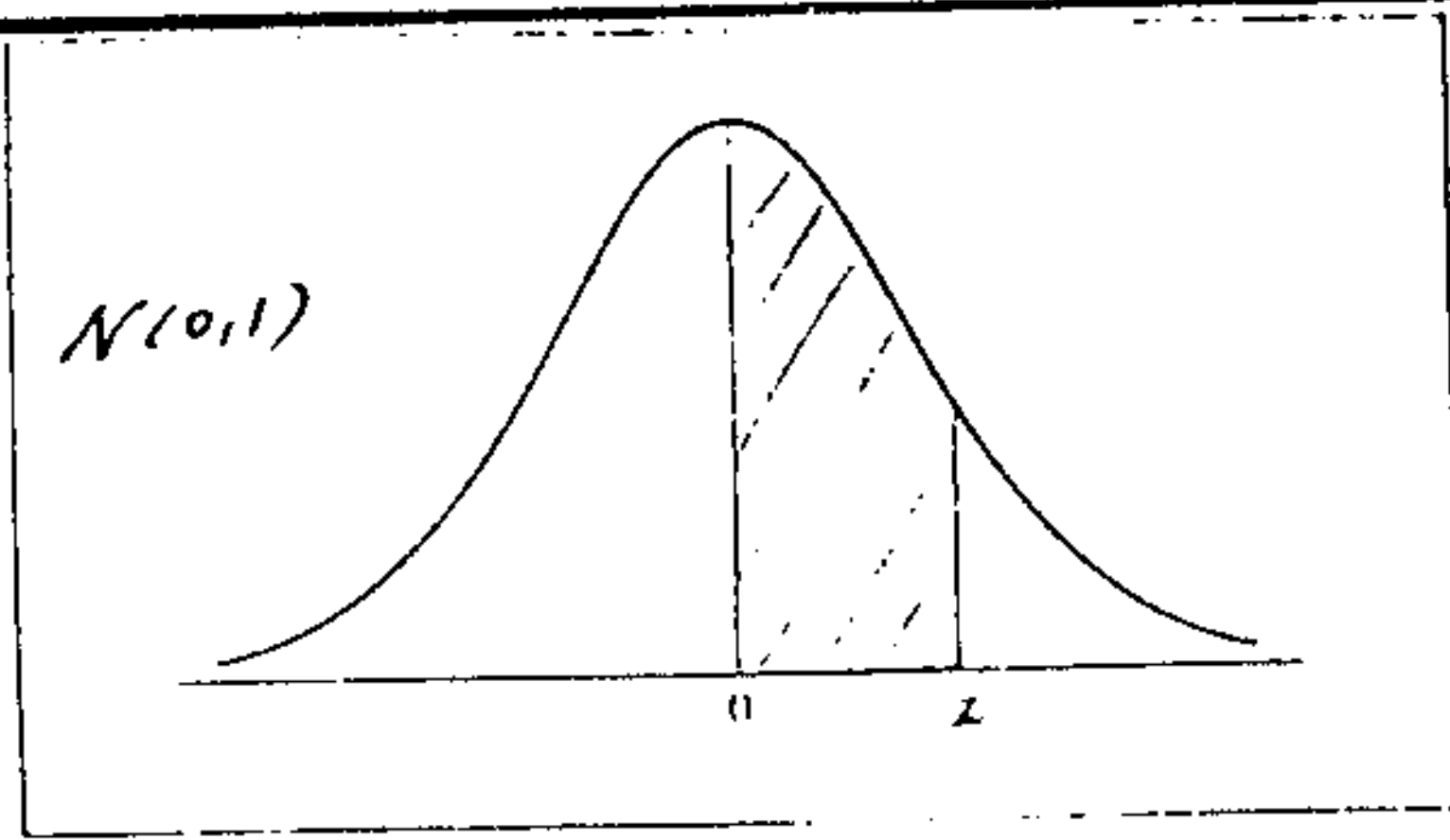


TABLE II. NORMAL-CURVE AREAS

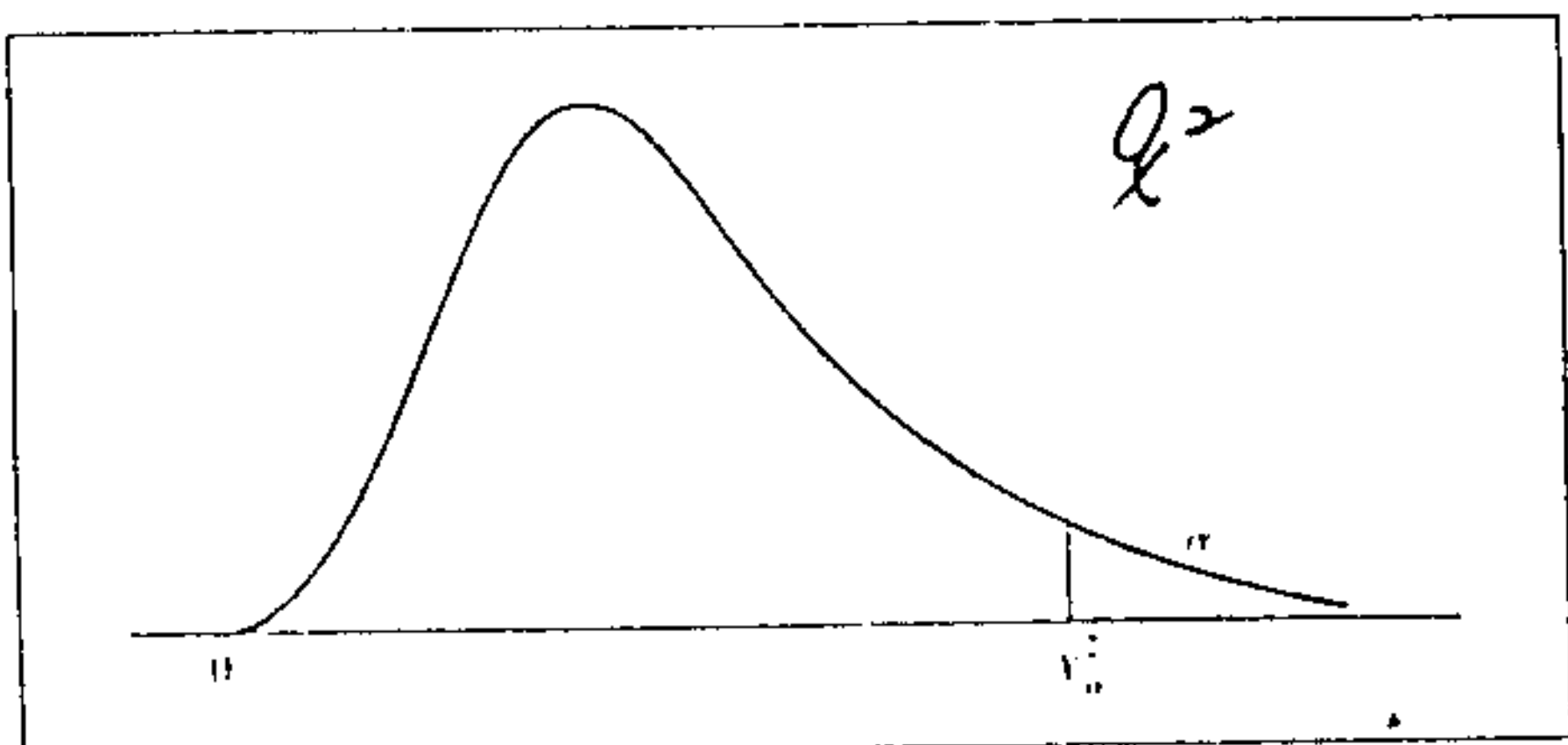
z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Also, for  $z = 4.0, 5.0,$  and  $6.0,$  the areas are  $0.49997, 0.4999997,$  and  $0.499999999.$

TABLE III. VALUES OF  $t^*$

d.f.	$t_{0.950}$	$t_{0.925}$	$t_{0.900}$	$t_{0.875}$	d.f.
1	6.314	12.706	31.821	63.657	1
2	2.920	4.303	6.965	9.925	2
3	2.353	3.182	4.541	5.841	3
4	2.132	2.776	3.747	4.604	4
5	2.015	2.571	3.365	4.032	5
6	1.943	2.447	3.143	3.707	6
7	1.895	2.365	2.998	3.499	7
8	1.860	2.306	2.896	3.355	8
9	1.833	2.262	2.821	3.250	9
10	1.812	2.228	2.764	3.169	10
11	1.796	2.201	2.718	3.106	11
12	1.782	2.179	2.681	3.055	12
13	1.771	2.160	2.650	3.012	13
14	1.761	2.145	2.624	2.977	14
15	1.753	2.131	2.602	2.947	15
16	1.746	2.120	2.583	2.921	16
17	1.740	2.110	2.567	2.898	17
18	1.734	2.101	2.552	2.878	18
19	1.729	2.093	2.539	2.861	19
20	1.725	2.086	2.528	2.845	20
21	1.721	2.080	2.518	2.831	21
22	1.717	2.074	2.508	2.819	22
23	1.714	2.069	2.500	2.807	23
24	1.711	2.064	2.492	2.797	24
25	1.708	2.060	2.485	2.787	25
26	1.706	2.056	2.479	2.779	26
27	1.703	2.052	2.473	2.771	27
28	1.701	2.048	2.467	2.763	28
29	1.699	2.045	2.462	2.756	29
inf.	1.645	1.960	2.326	2.576	inf.

Based on Table 2 of R. A. Johnson and D. W. Wichern, *Applied Multivariate Statistical Analysis*, Prentice-Hall, Upper Saddle River, N.J., 1982, by permission of the authors and publishers.



The entries in Table IV are values for which the area to their right under the chi-square distribution with given degrees of freedom (the gray area in the figure) is equal to  $\alpha$ .

TABLE IV. VALUES OF  $\chi^2_{\alpha}$

d.f.	$\chi^2_{0.05}$	$\chi^2_{0.01}$	d.f.
1	3.841	6.635	1
2	5.991	9.210	2
3	7.815	11.345	3
4	9.488	13.277	4
5	11.070	15.086	5
6	12.592	16.812	6
7	14.067	18.475	7
8	15.507	20.090	8
9	16.919	21.666	9
10	18.307	23.209	10
11	19.675	24.725	11
12	21.026	26.217	12
13	22.362	27.688	13
14	23.685	29.141	14
15	24.996	30.578	15
16	26.296	32.000	16
17	27.587	33.409	17
18	28.869	34.805	18
19	30.144	36.191	19
20	31.410	37.566	20
21	32.671	38.932	21
22	33.924	40.289	22
23	35.172	41.638	23
24	36.415	42.980	24
25	37.652	44.314	25
26	38.885	45.642	26
27	40.113	46.963	27
28	41.337	48.278	28
29	42.557	49.588	29
30	43.773	50.892	30

Table E5 Critical Values of F (Continued)

Denominator d.f.	Numerator d.f.									
	1	2	3	4	5	6	7	8	9	10
1	161.447	199.510	215.707	224.583	230.169	234.013	236.763	238.886	240.454	241.711
2	18.5128	16.0001	14.7853	14.0755	13.5925	13.2473	12.9896	12.7893	12.6263	12.5000
3	10.1286	8.45139	7.70859	7.29389	6.97455	6.71774	6.50992	6.34270	6.20929	6.10000
4	7.70859	6.59126	6.00013	5.64739	5.38932	5.19000	5.01992	4.88000	4.76929	4.68000
5	6.59126	5.75885	5.30013	4.99739	4.78932	4.62000	4.48992	4.38000	4.29929	4.23000
6	5.75885	5.10139	4.75013	4.50739	4.34932	4.22000	4.11992	4.03000	3.95929	3.89000
7	5.10139	4.58139	4.30013	4.10739	3.97932	3.88000	3.80992	3.74000	3.67929	3.62000
8	4.58139	4.18139	3.95013	3.80739	3.70932	3.63000	3.56992	3.51000	3.45929	3.40000
9	4.18139	3.84139	3.65013	3.53739	3.45932	3.39000	3.33992	3.28000	3.22929	3.17000
10	3.84139	3.54139	3.39013	3.29739	3.22932	3.16000	3.10992	3.05000	3.00929	2.95000
11	3.54139	3.28139	3.15013	3.07739	3.01932	2.95000	2.89992	2.84000	2.79929	2.75000
12	3.28139	3.05139	2.94013	2.87739	2.82932	2.76000	2.70992	2.65000	2.60929	2.56000
13	3.05139	2.84139	2.75013	2.69739	2.65932	2.59000	2.53992	2.48000	2.43929	2.39000
14	2.84139	2.65139	2.58013	2.53739	2.50932	2.44000	2.38992	2.33000	2.28929	2.24000
15	2.65139	2.48139	2.43013	2.39739	2.37932	2.31000	2.25992	2.20000	2.15929	2.11000
16	2.48139	2.33139	2.29013	2.26739	2.25932	2.19000	2.13992	2.08000	2.03929	1.99000
17	2.33139	2.19139	2.16013	2.14739	2.14932	2.08000	2.02992	1.97000	1.92929	1.88000
18	2.19139	2.06139	2.03013	2.02739	2.03932	1.97000	1.91992	1.86000	1.81929	1.77000
19	2.06139	1.94139	1.91013	1.90739	1.91932	1.85000	1.79992	1.74000	1.69929	1.65000
20	1.94139	1.83139	1.80013	1.79739	1.80932	1.74000	1.68992	1.63000	1.58929	1.54000
21	1.83139	1.73139	1.70013	1.69739	1.70932	1.64000	1.58992	1.53000	1.48929	1.44000
22	1.73139	1.64139	1.61013	1.60739	1.61932	1.55000	1.49992	1.44000	1.39929	1.35000
23	1.64139	1.56139	1.53013	1.52739	1.53932	1.47000	1.41992	1.36000	1.31929	1.27000
24	1.56139	1.48139	1.45013	1.44739	1.45932	1.39000	1.33992	1.28000	1.23929	1.19000
25	1.48139	1.41139	1.38013	1.37739	1.38932	1.32000	1.26992	1.21000	1.16929	1.12000
26	1.41139	1.34139	1.31013	1.30739	1.31932	1.25000	1.19992	1.14000	1.09929	1.05000
27	1.34139	1.27139	1.24013	1.23739	1.24932	1.18000	1.12992	1.07000	1.02929	0.98000
28	1.27139	1.20139	1.17013	1.16739	1.17932	1.11000	1.05992	1.00000	0.95929	0.91000
29	1.20139	1.13139	1.10013	1.09739	1.10932	1.04000	0.98992	0.93000	0.88929	0.84000
30	1.13139	1.06139	1.03013	1.02739	1.03932	0.97000	0.91992	0.86000	0.81929	0.77000

