

1. 在作假設檢定時有兩個假設，分別為虛無假設與對立假設，試說明兩者間之關係。(5分) 試說明虛無假設中，「虛無」之意涵為何？(5分)
2. 何謂假設檢定之檢定力？(4分) 影響檢定力大小之因素為何？(3分) 要如何提高檢定力？(3分)
3. 試分析超幾何分配，二項分配，波氏分配 (Poisson Distribution) 與常態分配間之關係。(5分) 試分析常態分配，Gamma 分配，卡方分配 (Chi-square 分配) 與 F 分配間之關係。(5分)
4. 某一選區有選民 50,000 人，若由此母體中隨機抽樣 1,000 人，其中表示會支持候選人甲有 400 人，試求候選人甲支持率 95% 之信賴區間，並分析此結果之意涵，包括說明 95% 信賴區間之意涵。(10分)
5. 某一位職業籃球員之投籃命中率为 0.6，此球員總共投 10 球，試求其投進 8 球的機率。(5分) 試求其在第 10 球投進第 8 球的機率。(5分)
6. 某地方銀行主管認為特定時段內，顧客隨機前來使用銀行提款機之人數服從波氏分配，因此他設立假設並搜集資料做檢定。下表資料顯示在一分鐘時間內，顧客前來使用該銀行提款機之人數。請檢定在 5% 顯著水準下，顧客前來人數是否服從波氏分配(15分)？

| 前來人數 | 觀察到次數 |
|------|-------|
| 0    | 7     |
| 1    | 18    |
| 2    | 25    |
| 3    | 17    |
| 4    | 12    |
| ≥5   | 5     |

7. 某大都市因人口移至郊區，為方便居民通勤，該市交通局決定擴充公車行車路線，並委託市營公共汽車公司進行規劃。目前有四條路線及有五位駕駛參與此項服務，欲瞭解各路線由郊區至市中心之行車時間是否不同，該公司登記各駕駛在各路線上之行車時間，整理如下表所示。在 5% 顯著水準之下，請檢定各行車路線是否影響平均行車時間(7分)？駕駛的因素是否影響行車時間(8分)？

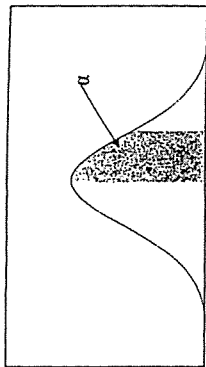
| 路線<br>駕駛 | 行車時間(分鐘) |    |    |    |
|----------|----------|----|----|----|
|          | 北        | 中  | 南  | 東  |
| D        | 18       | 17 | 21 | 22 |
| S        | 16       | 23 | 23 | 22 |
| O        | 21       | 21 | 26 | 22 |
| Z        | 23       | 22 | 29 | 25 |
| F        | 25       | 24 | 28 | 28 |

8. 某百貨公司的廣告支出及銷售金額如下表所示，請回答以下問題。
  - (1) 根據此資料估計簡單迴歸模型之係數，並對估計之斜率所代表的意涵作說明(10分)
  - (2) 根據此資料估計之判定係數為何？代表何意義？(5分)
  - (3) 請計算廣告支出及銷售金額之相關係數？(5分)

| 廣告   | 銷售金額 |
|------|------|
| 12.5 | 148  |
| 3.7  | 55   |
| 21.6 | 338  |
| 60.0 | 994  |
| 37.6 | 541  |
| 6.1  | 89   |
| 16.8 | 126  |
| 42.1 | 379  |

Poisson Probabilities

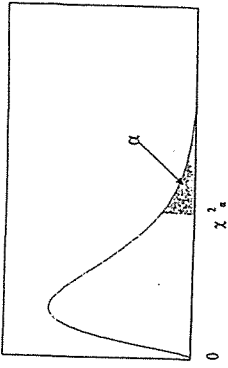
|    |       | λ     |       |       |       |       |       |       |       |       |       |
|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| x  |       | .005  | .01   | .02   | .03   | .04   | .05   | .06   | .07   | .08   | .09   |
| 0  | .9950 | .9900 | .9802 | .9704 | .9608 | .9512 | .9418 | .9324 | .9231 | .9139 | .9046 |
| 1  | .0050 | .0099 | .0196 | .0291 | .0384 | .0476 | .0565 | .0653 | .0738 | .0823 | .0907 |
| 2  | .0000 | .0000 | .0002 | .0004 | .0008 | .0012 | .0017 | .0023 | .0030 | .0037 | .0044 |
| 3  | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0001 |
| x  | .1    | .2    | .3    | .4    | .5    | .6    | .7    | .8    | .9    | 1.0   |       |
| 0  | .9048 | .8187 | .7408 | .6703 | .6065 | .5488 | .4966 | .4493 | .4066 | .3679 | .3329 |
| 1  | .0905 | .1637 | .2222 | .2681 | .3033 | .3293 | .3476 | .3595 | .3659 | .3679 | .3659 |
| 2  | .0045 | .0164 | .0333 | .0536 | .0758 | .0988 | .1217 | .1438 | .1647 | .1839 | .2013 |
| 3  | .0002 | .0011 | .0033 | .0072 | .0126 | .0198 | .0284 | .0383 | .0494 | .0613 | .0739 |
| 4  | .0000 | .0001 | .0003 | .0007 | .0016 | .0030 | .0050 | .0077 | .0111 | .0153 | .0200 |
| 5  | .0000 | .0000 | .0000 | .0000 | .0002 | .0004 | .0007 | .0012 | .0020 | .0031 | .0044 |
| 6  | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0002 | .0003 | .0005 | .0007 |
| 7  | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |
| x  | 1.1   | 1.2   | 1.3   | 1.4   | 1.5   | 1.6   | 1.7   | 1.8   | 1.9   | 2.0   |       |
| 0  | .3329 | .3012 | .2725 | .2466 | .2231 | .2019 | .1827 | .1653 | .1496 | .1353 | .1220 |
| 1  | .3662 | .3614 | .3543 | .3452 | .3347 | .3230 | .3106 | .2975 | .2842 | .2707 | .2572 |
| 2  | .2014 | .2169 | .2303 | .2417 | .2510 | .2584 | .2640 | .2678 | .2700 | .2707 | .2700 |
| 3  | .0738 | .0867 | .0998 | .1128 | .1255 | .1378 | .1496 | .1607 | .1710 | .1804 | .1880 |
| 4  | .0203 | .0260 | .0324 | .0395 | .0471 | .0551 | .0636 | .0723 | .0812 | .0902 | .0992 |
| 5  | .0045 | .0062 | .0084 | .0111 | .0141 | .0176 | .0216 | .0260 | .0309 | .0361 | .0415 |
| 6  | .0008 | .0012 | .0018 | .0026 | .0035 | .0047 | .0061 | .0078 | .0098 | .0120 | .0144 |
| 7  | .0001 | .0002 | .0003 | .0005 | .0008 | .0011 | .0015 | .0020 | .0027 | .0034 | .0041 |
| 8  | .0000 | .0000 | .0001 | .0001 | .0001 | .0002 | .0003 | .0005 | .0006 | .0009 | .0011 |
| 9  | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0001 | .0001 | .0002 |
| x  | 2.1   | 2.2   | 2.3   | 2.4   | 2.5   | 2.6   | 2.7   | 2.8   | 2.9   | 3.0   |       |
| 0  | .1225 | .1108 | .1003 | .0907 | .0821 | .0743 | .0672 | .0608 | .0550 | .0498 | .0450 |
| 1  | .2572 | .2438 | .2306 | .2177 | .2052 | .1931 | .1815 | .1703 | .1596 | .1494 | .1397 |
| 2  | .2700 | .2681 | .2652 | .2613 | .2565 | .2510 | .2450 | .2384 | .2314 | .2240 | .2166 |
| 3  | .1890 | .1966 | .2033 | .2090 | .2138 | .2176 | .2205 | .2225 | .2237 | .2240 | .2240 |
| 4  | .0992 | .1082 | .1169 | .1254 | .1336 | .1414 | .1488 | .1557 | .1622 | .1680 | .1733 |
| 5  | .0417 | .0476 | .0538 | .0602 | .0668 | .0735 | .0804 | .0872 | .0940 | .1008 | .1074 |
| 6  | .0146 | .0174 | .0206 | .0241 | .0278 | .0319 | .0362 | .0407 | .0455 | .0504 | .0552 |
| 7  | .0044 | .0055 | .0068 | .0083 | .0099 | .0118 | .0139 | .0163 | .0188 | .0216 | .0244 |
| 8  | .0011 | .0015 | .0019 | .0025 | .0031 | .0038 | .0047 | .0057 | .0068 | .0081 | .0094 |
| 9  | .0003 | .0004 | .0005 | .0007 | .0009 | .0011 | .0014 | .0018 | .0022 | .0027 | .0031 |
| 10 | .0001 | .0001 | .0001 | .0002 | .0002 | .0003 | .0004 | .0005 | .0006 | .0008 | .0010 |
| 11 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 | .0001 | .0001 | .0001 | .0002 | .0002 |
| 12 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0000 | .0001 |



標準常態累加機率值表

$P(0 < Z < z) = \alpha$

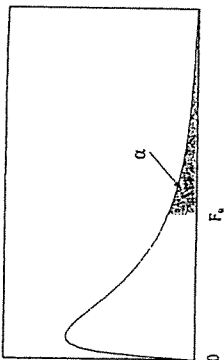
| z   | .00    | .01    | .02    | .03    | .04    | .05    | .06    | .07    | .08    | .09    |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0.0 | 0.0000 | 0.0040 | 0.0080 | 0.0120 | 0.0160 | 0.0199 | 0.0239 | 0.0279 | 0.0319 | 0.0359 |
| 0.1 | 0.0398 | 0.0438 | 0.0478 | 0.0517 | 0.0557 | 0.0596 | 0.0636 | 0.0675 | 0.0714 | 0.0753 |
| 0.2 | 0.0793 | 0.0832 | 0.0871 | 0.0910 | 0.0948 | 0.0987 | 0.1026 | 0.1064 | 0.1103 | 0.1141 |
| 0.3 | 0.1179 | 0.1217 | 0.1255 | 0.1293 | 0.1331 | 0.1368 | 0.1406 | 0.1443 | 0.1480 | 0.1517 |
| 0.4 | 0.1554 | 0.1591 | 0.1628 | 0.1664 | 0.1700 | 0.1736 | 0.1772 | 0.1808 | 0.1844 | 0.1879 |
| 0.5 | 0.1915 | 0.1950 | 0.1985 | 0.2019 | 0.2054 | 0.2088 | 0.2123 | 0.2157 | 0.2190 | 0.2224 |
| 0.6 | 0.2257 | 0.2291 | 0.2324 | 0.2357 | 0.2389 | 0.2422 | 0.2454 | 0.2486 | 0.2517 | 0.2549 |
| 0.7 | 0.2580 | 0.2611 | 0.2642 | 0.2673 | 0.2704 | 0.2734 | 0.2764 | 0.2794 | 0.2823 | 0.2852 |
| 0.8 | 0.2881 | 0.2910 | 0.2939 | 0.2967 | 0.2995 | 0.3023 | 0.3051 | 0.3078 | 0.3106 | 0.3133 |
| 0.9 | 0.3159 | 0.3186 | 0.3212 | 0.3238 | 0.3264 | 0.3289 | 0.3315 | 0.3340 | 0.3365 | 0.3389 |
| 1.0 | 0.3413 | 0.3438 | 0.3461 | 0.3485 | 0.3508 | 0.3531 | 0.3554 | 0.3577 | 0.3599 | 0.3621 |
| 1.1 | 0.3643 | 0.3665 | 0.3686 | 0.3708 | 0.3729 | 0.3749 | 0.3770 | 0.3790 | 0.3810 | 0.3830 |
| 1.2 | 0.3849 | 0.3869 | 0.3888 | 0.3907 | 0.3925 | 0.3944 | 0.3962 | 0.3980 | 0.3997 | 0.4015 |
| 1.3 | 0.4032 | 0.4049 | 0.4066 | 0.4082 | 0.4099 | 0.4115 | 0.4131 | 0.4147 | 0.4162 | 0.4177 |
| 1.4 | 0.4192 | 0.4207 | 0.4222 | 0.4236 | 0.4251 | 0.4265 | 0.4279 | 0.4292 | 0.4306 | 0.4319 |
| 1.5 | 0.4332 | 0.4345 | 0.4357 | 0.4370 | 0.4382 | 0.4394 | 0.4406 | 0.4418 | 0.4429 | 0.4441 |
| 1.6 | 0.4452 | 0.4463 | 0.4474 | 0.4484 | 0.4495 | 0.4505 | 0.4515 | 0.4525 | 0.4535 | 0.4545 |
| 1.7 | 0.4554 | 0.4564 | 0.4573 | 0.4582 | 0.4591 | 0.4599 | 0.4608 | 0.4616 | 0.4625 | 0.4633 |
| 1.8 | 0.4641 | 0.4649 | 0.4656 | 0.4664 | 0.4671 | 0.4678 | 0.4686 | 0.4693 | 0.4699 | 0.4706 |
| 1.9 | 0.4713 | 0.4719 | 0.4726 | 0.4732 | 0.4738 | 0.4744 | 0.4750 | 0.4756 | 0.4761 | 0.4767 |
| 2.0 | 0.4772 | 0.4778 | 0.4783 | 0.4788 | 0.4793 | 0.4798 | 0.4803 | 0.4808 | 0.4812 | 0.4817 |
| 2.1 | 0.4821 | 0.4826 | 0.4830 | 0.4834 | 0.4838 | 0.4842 | 0.4846 | 0.4850 | 0.4854 | 0.4857 |
| 2.2 | 0.4861 | 0.4864 | 0.4868 | 0.4871 | 0.4875 | 0.4878 | 0.4881 | 0.4884 | 0.4887 | 0.4890 |
| 2.3 | 0.4893 | 0.4896 | 0.4898 | 0.4901 | 0.4904 | 0.4906 | 0.4909 | 0.4911 | 0.4913 | 0.4916 |
| 2.4 | 0.4918 | 0.4920 | 0.4922 | 0.4925 | 0.4927 | 0.4929 | 0.4931 | 0.4932 | 0.4934 | 0.4936 |
| 2.5 | 0.4938 | 0.4940 | 0.4941 | 0.4943 | 0.4945 | 0.4946 | 0.4948 | 0.4949 | 0.4951 | 0.4952 |
| 2.6 | 0.4953 | 0.4955 | 0.4956 | 0.4957 | 0.4959 | 0.4960 | 0.4961 | 0.4962 | 0.4963 | 0.4964 |
| 2.7 | 0.4965 | 0.4966 | 0.4967 | 0.4968 | 0.4969 | 0.4970 | 0.4971 | 0.4972 | 0.4973 | 0.4974 |
| 2.8 | 0.4974 | 0.4975 | 0.4976 | 0.4977 | 0.4977 | 0.4978 | 0.4979 | 0.4979 | 0.4980 | 0.4981 |
| 2.9 | 0.4981 | 0.4982 | 0.4982 | 0.4983 | 0.4984 | 0.4984 | 0.4985 | 0.4985 | 0.4986 | 0.4986 |
| 3.0 | 0.4987 | 0.4987 | 0.4987 | 0.4988 | 0.4988 | 0.4989 | 0.4989 | 0.4989 | 0.4990 | 0.4990 |



卡方分配臨界值表

$$P(x^2 > x_\alpha^2) = \alpha$$

| df  | $\chi_{0.100}^2$ | $\chi_{0.050}^2$ | $\chi_{0.025}^2$ | $\chi_{0.010}^2$ | $\chi_{0.005}^2$ |
|-----|------------------|------------------|------------------|------------------|------------------|
| 1   | 2.705541         | 3.841455         | 5.023903         | 6.634891         | 7.879400         |
| 2   | 4.605176         | 5.991476         | 7.377779         | 9.210351         | 10.5965          |
| 3   | 6.251394         | 7.814725         | 9.348404         | 11.3449          | 12.8381          |
| 4   | 7.779434         | 9.487728         | 11.1433          | 13.2767          | 14.8602          |
| 5   | 9.236349         | 11.0705          | 12.8325          | 15.0863          | 16.7496          |
| 6   | 10.6446          | 12.5916          | 14.4494          | 16.8119          | 18.5475          |
| 7   | 12.0170          | 14.0671          | 16.0128          | 18.4753          | 20.2777          |
| 8   | 13.3616          | 15.5073          | 17.5345          | 20.0902          | 21.9549          |
| 9   | 14.6837          | 16.9190          | 19.0228          | 21.6660          | 23.5893          |
| 10  | 15.9872          | 18.3070          | 20.4832          | 23.2093          | 25.1881          |
| 11  | 17.2750          | 19.6752          | 21.9200          | 24.7250          | 26.7569          |
| 12  | 18.5493          | 21.0261          | 23.3367          | 26.2170          | 28.2997          |
| 13  | 19.8119          | 22.3620          | 24.7356          | 27.6882          | 29.8193          |
| 14  | 21.0641          | 23.6848          | 26.1189          | 29.1412          | 31.3194          |
| 15  | 22.3071          | 24.9958          | 27.4884          | 30.5780          | 32.8015          |
| 16  | 23.5418          | 26.2962          | 28.8453          | 31.9999          | 34.2671          |
| 17  | 24.7690          | 27.5871          | 30.1910          | 33.4087          | 35.7184          |
| 18  | 25.9894          | 28.8693          | 31.5264          | 34.8052          | 37.1564          |
| 19  | 27.2036          | 30.1435          | 32.8523          | 36.1908          | 38.5821          |
| 20  | 28.4120          | 31.4104          | 34.1696          | 37.5663          | 39.9969          |
| 21  | 29.6151          | 32.6706          | 35.4789          | 38.9322          | 41.4009          |
| 22  | 30.8133          | 33.9245          | 36.7807          | 40.2894          | 42.7957          |
| 23  | 32.0069          | 35.1725          | 38.0756          | 41.6383          | 44.1814          |
| 24  | 33.1962          | 36.4150          | 39.3641          | 42.9798          | 45.5584          |
| 25  | 34.3816          | 37.6525          | 40.6465          | 44.3140          | 46.9280          |
| 26  | 35.5632          | 38.8851          | 41.9231          | 45.6416          | 48.2898          |
| 27  | 36.7412          | 40.1133          | 43.1945          | 46.9628          | 49.6450          |
| 28  | 37.9159          | 41.3372          | 44.4608          | 48.2782          | 50.9936          |
| 29  | 39.0875          | 42.5569          | 45.7223          | 49.5878          | 52.3355          |
| 30  | 40.2560          | 43.7730          | 46.9792          | 50.8922          | 53.6719          |
| 40  | 51.8050          | 55.7585          | 59.3417          | 63.6908          | 66.7660          |
| 50  | 63.1671          | 67.5048          | 71.4202          | 76.1538          | 79.4898          |
| 60  | 74.3970          | 79.0820          | 83.2977          | 88.3794          | 91.9518          |
| 80  | 96.5782          | 101.879          | 106.629          | 112.329          | 116.321          |
| 100 | 118.498          | 124.342          | 129.561          | 135.807          | 140.170          |



F 分配臨界值表

$$P(F > F_\alpha) = \alpha$$

| $\nu_1(df)$ | $\nu_2(df)$ |        |        |        |        |        |        |        |        |
|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
|             | 1           | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      |
| 1           | 161.45      | 199.50 | 215.71 | 224.58 | 230.16 | 233.99 | 236.77 | 238.88 | 240.54 |
| 2           | 18.51       | 19.00  | 19.16  | 19.25  | 19.30  | 19.33  | 19.35  | 19.37  | 19.38  |
| 3           | 10.13       | 9.55   | 9.28   | 9.12   | 9.01   | 8.94   | 8.89   | 8.85   | 8.81   |
| 4           | 7.71        | 6.94   | 6.59   | 6.39   | 6.26   | 6.16   | 6.09   | 6.04   | 6.00   |
| 5           | 6.61        | 5.79   | 5.41   | 5.19   | 5.05   | 4.95   | 4.88   | 4.82   | 4.77   |
| 6           | 5.99        | 5.14   | 4.76   | 4.53   | 4.39   | 4.28   | 4.21   | 4.15   | 4.10   |
| 7           | 5.59        | 4.74   | 4.35   | 4.12   | 3.97   | 3.87   | 3.79   | 3.73   | 3.68   |
| 8           | 5.32        | 4.46   | 4.07   | 3.84   | 3.69   | 3.58   | 3.50   | 3.44   | 3.39   |
| 9           | 5.12        | 4.26   | 3.86   | 3.63   | 3.48   | 3.37   | 3.29   | 3.23   | 3.18   |
| 10          | 4.96        | 4.10   | 3.71   | 3.48   | 3.33   | 3.22   | 3.14   | 3.07   | 3.02   |
| 11          | 4.84        | 3.98   | 3.59   | 3.36   | 3.20   | 3.09   | 3.01   | 2.95   | 2.90   |
| 12          | 4.75        | 3.89   | 3.49   | 3.26   | 3.11   | 3.00   | 2.91   | 2.85   | 2.80   |
| 13          | 4.67        | 3.81   | 3.41   | 3.18   | 3.03   | 2.92   | 2.83   | 2.77   | 2.71   |
| 14          | 4.60        | 3.74   | 3.34   | 3.11   | 2.96   | 2.85   | 2.76   | 2.70   | 2.65   |
| 15          | 4.54        | 3.68   | 3.29   | 3.06   | 2.90   | 2.79   | 2.71   | 2.64   | 2.59   |
| 16          | 4.49        | 3.63   | 3.24   | 3.01   | 2.85   | 2.74   | 2.66   | 2.59   | 2.54   |
| 17          | 4.45        | 3.59   | 3.20   | 2.96   | 2.81   | 2.70   | 2.61   | 2.55   | 2.49   |
| 18          | 4.41        | 3.55   | 3.16   | 2.93   | 2.77   | 2.66   | 2.58   | 2.51   | 2.46   |
| 19          | 4.38        | 3.52   | 3.13   | 2.90   | 2.74   | 2.63   | 2.54   | 2.48   | 2.42   |
| 20          | 4.35        | 3.49   | 3.10   | 2.87   | 2.71   | 2.60   | 2.51   | 2.45   | 2.39   |
| 21          | 4.32        | 3.47   | 3.07   | 2.84   | 2.68   | 2.57   | 2.49   | 2.42   | 2.37   |
| 22          | 4.30        | 3.44   | 3.05   | 2.82   | 2.66   | 2.55   | 2.46   | 2.40   | 2.34   |
| 23          | 4.28        | 3.42   | 3.03   | 2.80   | 2.64   | 2.53   | 2.44   | 2.37   | 2.32   |
| 24          | 4.26        | 3.40   | 3.01   | 2.78   | 2.62   | 2.51   | 2.42   | 2.36   | 2.30   |
| 25          | 4.24        | 3.39   | 2.99   | 2.76   | 2.60   | 2.49   | 2.40   | 2.34   | 2.28   |
| 26          | 4.23        | 3.37   | 2.98   | 2.74   | 2.59   | 2.47   | 2.39   | 2.32   | 2.27   |
| 27          | 4.21        | 3.35   | 2.96   | 2.73   | 2.57   | 2.46   | 2.37   | 2.31   | 2.25   |
| 28          | 4.20        | 3.34   | 2.95   | 2.71   | 2.56   | 2.45   | 2.36   | 2.29   | 2.24   |
| 29          | 4.18        | 3.33   | 2.93   | 2.70   | 2.55   | 2.44   | 2.35   | 2.28   | 2.22   |
| 30          | 4.17        | 3.32   | 2.92   | 2.69   | 2.53   | 2.42   | 2.33   | 2.27   | 2.21   |
| 40          | 4.08        | 3.23   | 2.84   | 2.61   | 2.45   | 2.34   | 2.25   | 2.18   | 2.12   |
| 60          | 4.00        | 3.15   | 2.76   | 2.53   | 2.37   | 2.25   | 2.17   | 2.10   | 2.04   |
| 120         | 3.92        | 3.07   | 2.68   | 2.45   | 2.29   | 2.18   | 2.09   | 2.02   | 1.96   |
| $\infty$    | 3.84        | 3.00   | 2.60   | 2.37   | 2.21   | 2.10   | 2.01   | 1.94   | 1.88   |