國立雲林科技大學
101學年度碩士班暨碩士在職專班招生考試試題

系所: 工管所、運籌所
科目: 經濟學(1)

本份試卷第一部分爲 25 題單選題，每題 2 分，請依題目順序將答案寫在答案卷上

1. The term "inverse demand curve" refers to
   (A) the demand for "inverses."
   (B) expressing the demand curve in terms of price as a function of quantity
   (C) the difference between quantity demanded and supplied at each price
   (D) a demand curve that slopes upward
2. Assume the price of a movie is $10. Jenna demands 2 movies per week, Sam demands 3 movies per week, and Jordan demands 8 movies per week. From this information we can conclude that
   (A) Sam is irrational compared to Jenna or Jordan
   (B) Jordan is obviously more wealthy than either Sam or Jeanna
   (C) the movie industry is unprofitable.
   (D) the market quantity demanded at a price of $10 is at least 13 movies per week
3. A vertical demand curve for a particular good implies that consumers are
   (A) not interested in that good
   (B) irrational.
   (C) not sensitive to changes in the price of that good
   (D) sensitive to changes in the price of that good
4. If the demand function for orange juice is expressed as Q = 2000 - 500p, where Q is quantity in gallons and p is price per gallon measured in dollars, then the demand for orange juice has a unitary elasticity when price equals
   (A) $0
   (B) $1
   (C) $2
   (D) $4
5. On a linear demand curve, the lower the price,
   (A) the elasticity equals -1.
   (B) the less elastic is demand.
   (C) the elasticity equals zero.
   (D) the more elastic is demand
6. Convexity of indifference curves implies that consumers are willing to
   (A) settle for less of both "x" and "y"
   (B) acquire more "x" only if they do not have to give up any "y"
   (C) give up more "y" to get an extra "x" the more "x" they have
   (D) give up more "y" to get an extra "x" the less "x" they have.
7. If the utility function (U) between food (F) and clothing (C) can be represented as $U = \sqrt{F \times C}$, the marginal rate of substitution of clothing for food equals
   (A) -F/C (B) -C/F (C) $-\sqrt{C/F}$ (D) $-\sqrt{F/C}$

8. An inferior good exhibits
   (A) a decline in the quantity demanded as income rises
   (B) a downward sloping Engel curve
   (C) a negative income elasticity
   (D) All of the above
9. What is the primary difference between the substitution and the income effect of a price change?
   (A) The substitution effect holds income constant and the income effect holds utility constant
   (B) The substitution effect is always negative and the income effect is always positive
   (C) The substitution effect holds utility constant and the income effect holds prices constant
   (D) The substitution effect is always positive and the income effect is always negative
10. Isoquants that are downward-sloping straight lines exhibit
   (A) a decreasing marginal rate of technical substitution
   (B) an increasing marginal rate of technical substitution
   (C) a marginal rate of technical substitution that cannot be determined
   (D) a constant marginal rate of technical substitution
11. Let the production function be $q=AL^aK^b$. Returns to scale are equal to
   (A) a + b (B) $L^a + K^b$ (C) a * b (D) A * L
12. Suppose the short-run production function is q = 10 * L. If the wage rate is $10 per unit of labor, then MC equals
   (A) q/10 (B) q (C) 1 (D) 10/q
13. Assuming that w and r are both positive, if the long-run expansion path is horizontal, then
   (A) MRTS is a function of capital only
   (B) w = r
   (C) $MP_K = 0$
   (D) All of the above
14. If all conditions for a perfectly competitive market are met
   (A) firms demand curves are horizontal
   (B) the market demand curve is horizontal
   (C) firms face sunk cost when entering the market
   (D) the firms' demand curves are downward-sloping
15. Producer surplus equals
   (A) total revenue minus total variable cost
   (B) profit plus fixed cost
   (C) total revenue minus the sum of all marginal cost
   (D) All of the above
16. Which of the following is not a potential result of a price floor?
   (A) Price greater than free-market equilibrium price
   (B) Excess supply

(C) Lower quality inputs are used which increases marginal cost

(D) All of the above

17. If a society only cares about efficiency and not equity, then

(A) all points on the contract curve yield the same level of social welfare

(B) it will not rely on competitive markets to allocate goods

(C) an equitable outcome is impossible

(D) it will maximize the utility of its worst-off member

18. If a monopoly discovers that the demand for its output has become more elastic at the original output level, then it will respond by

(A) setting a lower price

(B) producing more while leaving price unchanged

(C) producing more and setting a higher price

(D) setting a higher price

19. The producer surplus to a monopolist must be

(A) positive, otherwise why would the monopoly produce?

(B) at least as great as the producer surplus in a competitive market.

(C) less than zero or the firm is in violation of anti-trust statutes.

(D) the same as for a competitive market.

20. A perfect-price-discriminating monopoly's marginal revenue curve

(A) varies for each consumer.

(B) is the demand curve.

(C) lies below the demand curve.

(D) is the same as the monopolist's marginal revenue curve.

21. Airlines offer lower prices to vacationers than to business travelers because

(A) of government regulations requiring them to do so.

(B) business travelers are less flexible in their travel plans than vacationers are.

(C) airlines know that business travelers enjoy flying more than vacationers do.

(D) business travelers do not care at all about costs.

22. A typical firm in a cartel will hold which of the following attitudes?

(A) If everyone cheats, I'm better off, and so is everyone in the cartel.

(B) If I suspect others are planning to cheat, I'll do best for myself by deciding not to cheat.

(C) I can never do better for myself than following agreed-upon cartel rules.

(D) If I alone cheat, I'm better off; if everyone cheats, I'm worse off.

23. Suppose a market with a Cournot structure has five firms and a market price elasticity of demand equal to -2. What is a Cournot firm's Lerner Index?

(A) 1 (B) 0.2 (C) 0.1 (D) 0.5

24. A strategy is dominant if

(A) the player cannot gain by changing strategy, assuming that no other player changes strategy

(B) it yields a greater payoff than any other player receives.

(C) it is part of a Nash equilibrium.

(D) it yields a payoff at least as large as that from any other strategy, regardless of the actions of other players.

25. If a Cournot duopolist announced that it will double its output

(A) the other firm does not view the announcement as credible.

(B) it becomes the leader.

(C) the other firm will double output also.

(D) the other firm will shut down.

本份試卷第二部分爲 **9** 大題填充題，每小題 **2** 分，請在答案卷上依照以下格式作答，僅填答案即可，不需說明原因及計算過程。

作答範例:

(1) 答案... (不需說明原因及計算過程)_____

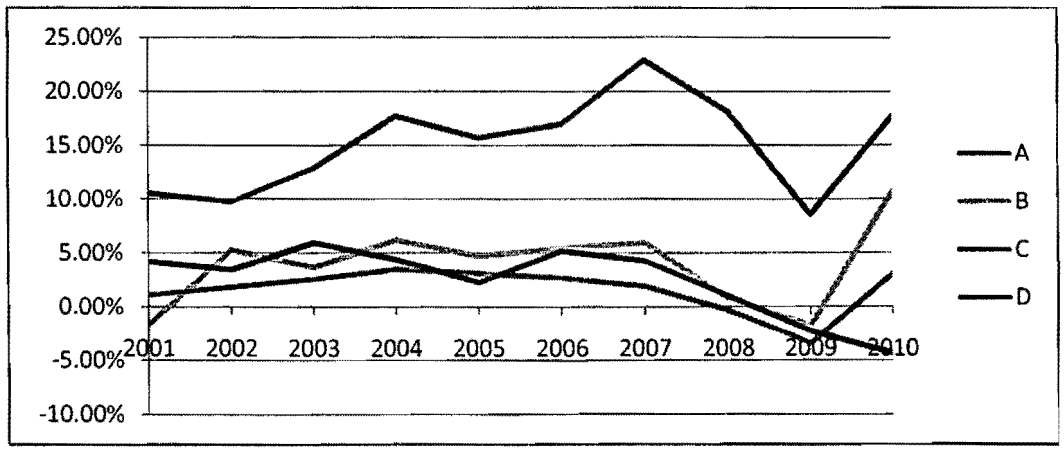
(2) 答案..._____

(3) 答案..._____

..._____

(25) 答案..._____

1. 下圖畫出台灣、中國大陸、美國及希臘 2001 到 2010 的國內生產毛額(GDP)成長率的走勢，2010 年的值由高到低分別爲 A 線，B 線，C 線，及 D 線。請問這四條線分別爲哪個國家的 GDP 成長率走勢? A 線爲(1), B 線爲(2), C 線爲(3), D 線爲(4)。(答案請填國家名稱)



2. 大四的小花寒假從韓國進口 200 件成衣回台網拍，每件成本爲 500 元。一開始售價爲 1,000, 但銷路不好只賣出 50 件，開學後小花急需現金繳學費, 無奈之下只好以 300 的價格將其餘 150

件賠本賣出。假設小花會誠實的申報所得，請問小花的網拍活動使得台灣國內生產毛額(GDP)的金額增加了(5)。

3. 在台灣年滿 65 歲，曾加入過農保滿 6 個月以上之農民，並符合老年農民福利津貼暫行條例第 3 條之規定者，可向所屬農會申請老農津貼，每月領取 NT$6,000 元。發放其死亡當月止。以下爲 2012.1.3 中央社的新聞報導:

> 總統去年底公布修正老農福利津貼暫行條例，明定今年 1 月起，老農津貼調整為每月新台幣 7,000 元。勞保局今天說，老農津貼加碼將在 2 月 20 日首次入帳，約 68 萬多人受惠。
>
> 為落實照顧老年農、漁民生活，總統在去年 12 月 21 日公布修正老年農民福利津貼暫行條例，修法同時明定未來每 4 年，將依消費者物價指數成長率調整發放金額，但成長率為零或負數時，不予調整。
>
> 行政院勞工委員會勞工保險局補充說明，這次修法也增訂排富規定：所得部分，非農業所得超過 50 萬元以上者，不能領取老農津貼；不動產方面，扣除農地、農舍後，個人所有土地及房屋價值，合計超過 500 萬元以上者，不能領取老農津貼；但沒有農舍且是個人所有實際居住的唯一房屋，最多可扣除 400 萬元。

(a) 請問老農津貼在總統大選前由 6,000 加碼到 7,000 元，老農樂開懷。請問根據新聞報導的數字計算加碼後政府每年需要增加的開銷爲(6)。

(b) 老農津貼 1995 年首次實施時的額度爲 3,000 元，後來每隔幾年便加碼 1,000 元，上次調整到 6,000 的日期爲 2007 年 8 月，當時的物價指數爲 102。2012 年年初的消費者物價指數來到 108。請問這次加碼若是依照物價成長率進行調整而非直接加 1,000 元，則應每月發放金額應調整到(7)。

4. 貧富差距向來是總統大選的重要議題。花旗銀行於 2011 年 6 月出具的亞洲經濟展望報告便指出，台灣總統大選的決勝點，就在就業與縮短貧富差距。2008 年總統大選辯論時，馬總統在電視對全國民眾承諾一定要把家庭所得的貧富差距倍數拉到 6 倍以下。根據行政院主計處「家庭收支調查」，從 2008 至 2010 台灣貧富差距分別爲 6.05、6.34、6.19 倍。

(a) 行政院主計處「家庭收支調查」中的貧富差距是根據最有錢 X%的平均家庭可支配所得除以最貧窮的 X%家庭平均可支配所得。請問 X 爲多少? (8)

(b) 以下何者較可能是造成近 20 年來台灣貧富差距逐漸擴大的原因: (9) (請填 i, ii 或 iii)

i) 有錢人的所得增加的比窮人增加的快。

ii) 有錢人的所得增加，但窮人的所得原地踏步。

iii) 有錢人的所得原地踏步，窮人的所得不增反減。

(c) 請寫出一項政府目前正在推動可能有助於縮小貧富差距的政策 (限 10 字以內): (10)

5. 請閱讀以下中央社 2011.12.14 日的報導後回答問題:

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科目: 經濟學(1)

義大利國會準備通過 300 億歐元緊急預算方案，該國最新標售 30 億歐元（39 億美元）5 年期公債，達最高籌資目標，惟舉債成本飆上 1997 年以來新高。義國國庫局今天以 6.47%殖利率售出這些債券，比 11 月 14 日上回標售時的 6.29%還高。本次發債需求達標售額度 1.42 倍，投標倍數不及上月的 1.47 倍。

蒙蒂昨晚在羅馬向義國眾議院財政及預算委員會表示：「我們有信心，市場將對義大利所作的努力給予正面回應，也許不會是明天，但我們預期未來幾個月舉債成本降低，將有助於提振經濟。」

台北時間晚間 6 時 14 分，義國標債後的基準 10 年債殖利率為 6.65%，和德國同期公債間的殖利率差來到 4.62 個百分點。

(a) 請寫下債券殖利率的定義 (限 10 個字以內)。(11)

(b) 義大利的公債殖利率比德國的要高 4.62%，其背後反應了何種風險 (限 5 個字以內)? (12)

6. 某開放經濟體系的國民所得資料如下

Y (國民所得)=10,000

C (民間消費)=6,000

T (稅收)=1,500

G (政府支出) =1,700

I (民間投資) = 3,300 – 10000r, (r=實質利率)

NX (淨出口)= -500

請計算以下的總體經濟變數:

(a) 民間儲蓄(private saving) = (13)

(b) 政府儲蓄(public saving) = (14)

(c) 資本淨流出(net capital outflow)= (15)

(d) 均衡投資 I*= (16)

(e) 均衡實質利率 r*= (17)

7. 台灣可口可樂一罐 25 元，美國可口可樂一罐 0.8 美元。目前新台幣兌美元的匯率約爲 30。

(a) 假設沒有運輸及交易成本，請問要如何在兩國間買賣可樂而獲利 (請填 i 或 ii)? (18)

i) 台灣買進，美國賣出

ii) 美國買進，台灣賣出。

(b) 請問根據購買力平價假說(Purchasing Power Parity)，用可樂的價格所計算出的合理新台幣兌美元匯率應是多少? (19)

(c) 若台灣政府突然增加貨幣供給量兩倍，在貨幣數量說以及購買力平價假說的假設之下，新台幣兌美元匯率將變爲(20)。

8. 請閱讀以下中國時報 2012.1.27 日的報導後回答問題:

國立雲林科技大學
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美國聯邦準備理事會廿五日微幅下修今明兩年的美國經濟成長預測，同時以經濟前景面臨「顯著下滑風險」為由，宣示可能將現行趨近零的超低利率延長至二〇一四年底，並表示倘若經濟態勢惡化，可能推出新的寬鬆貨幣政策；市場認為這代表第三波量化寬鬆（QE3）必要時會推出。針對聯準會突然宣示可能將超低利率延長十八個月，直至二〇一四年底。投資銀行「RBC Capital Markets」美國首席經濟學家波切利（Tom Porcelli）指出，這代表聯準會「嚇壞了」，其低利率政策並未收到應有的成效。

(a) 請問聯邦準備銀行實際上如何執行量化寬鬆政策? (21) (答案限 10 字以內)
(b) 請問除了量化寬鬆以外，請舉出其他 2 個貨幣主觀機關可以引導市場利率下降的方法? (22), (23)。
(c) 凱因斯提出量化寬鬆政策無法收到應有的成效的原因稱之爲 (24)。

9. 以下何者與 2011 年諾貝爾經濟學獎得主 T. Sargent 的研究方法及研究成果較不相關: (25) (請填 i, ii, iii 或 iv)
i) 以理性預期的概念來推導總體經濟模型
ii) 使用向量自我迴歸(vector auto-regression)來估計總體經濟模型中的參數
iii) 被預期到的政府政策是無效的
iv) 菲利浦曲線是一條垂直線

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系所：工管所、運籌所
科目：微積分(2)

填充題共 20 題，每題 5 分

1. Please solve the inequality $|x-1|-|x-3| \geq 5$

2. Find the value of a such that the $\lim_{x\to -2} \dfrac{3x^2+ax+a+3}{x^2+x-2}$ exists.

3. For a function $f(x)=x^2-x-4$, please find a number δ such that if $|x-2|<\delta$ then $|f(x)+2|<1$.

4. Find the limit $\lim_{x\to 2}\left(\dfrac{1}{x-2}-\dfrac{1}{x^2-3x+2}\right)$

5. Please find the normal line of the tangent for equation $x^2+xy+y^2=3$ at point (1, 2).

6. Find the limit value of $\lim_{x\to -1}\dfrac{\sin(x+1)}{x^2-2x-3}$.

7. A boat is pulled into a dock by a rope attached to the bow of the boat and pass through a pulley on the dock that is 1 m higher than the bow of the boat. If the rope is pulled in at the rate of 1 m/s, how fast is the boat approaching the dock when it is 8 m from the dock?

8. If $f(2)=8$ and $f'(x)\geq 5$ for $2\leq x\leq 6$, how small can the $f(6)$ possible be?

9. Using Newton's method to find a root of the equation $x^5=5x-2$. Calculate two iterations.

10. Find the limit value of $\lim_{x\to\infty}(xe^{1/x}-x)$.

11. Find the sum of the series $1+\sum_{n=1}^{\infty}(-1)^n\left(\dfrac{e^n}{n!}\right)$

12. Find the radius of convergence of the series $\sum_{n=1}^{\infty}\dfrac{(2n)!}{(n!)^2}x^n$

13. Find $\int_0^{\pi/2}\dfrac{\sin x}{1+\cos x^2}dx$

14. If $f(x)=x+x^2+e^x$ and $g(x)=f^{-1}(x)$, find $g'(1)$.

15. Find $\int_0^{\ln 10}\dfrac{e^x\sqrt{e^x-1}}{e^x+8}dx$

16. Find $\int_0^1\dfrac{\ln x}{\sqrt{x}}dx$

17. $y'+y=\sqrt{x}e^{-x}$, $y(0)=3$, find $y(x)$

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18. Find $\iint_D (x^2 + y^2)^{3/2} dA$, where D is the region in the first quadrant bounded by the lines $y = 0$ and $y = \sqrt{3}x$ and the circle $x^2 + y^2 = 9$.

19. Find the maximum rate of change of f at the given point and the direction in which it occur.
$f(x, y, z) = \ln(xy^2z^3)$, (1-2,-3)

20. $yz = \ln(x + z)$, find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.

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系所：運籌所
科目：統計學(2)

本試題共七題，合計 100 分，請依題號作答並將答案寫在答案卷上，違者不予計分。

1. In the daily production of a certain kind of rope, the number of defects per foot Y is assumed to have a Poisson distribution with mean $\lambda = 2$. The profit per foot when the rope is sold is given by X, where $X = 50 - 2Y - Y^2$. Find the expected profit per foot. (10%)

2. Three brands of coffee, X, Y, Z, are to be ranked according to taste by a judge. Define the following events:

   A: Brand X is preferred to Y.
   B: Brand X is ranked best.
   C: Brand X is ranked second best.
   D: Brand X is ranked third best.

   If the judge actually has no taste preference and thus randomly assigns ranks to the brands, is event A independent of events B, C, and D? (10%)

3. A manufacturer of tires wants to advertise a mileage interval that excludes no more than 10% of the mileages on tires he sells. All he knows is that, for a large number of tires tested, the mean mileage was 25,000 miles, with a standard deviation of 4,000 miles. What interval would you suggest? (10%)

4. Let X_1, X_2, X_3 be mutually independent random variables with Poisson distributions having means 2, 1, 4, respectively.
   (a) Find the distribution of $Y = X_1 + X_2 + X_3$ and its expected value and variance. (5%)
   (b) Compute $P(3 \le Y \le 9)$. (5%)

5. The service times for customers coming through a checkout counter in a retail store are independent random variables with a mean of 1.5 minutes and a variance of 1.0. Will it be possible that 100 customers can be served in less than 2 hours of total service time? (10%)

6. 經隨機調查某送貨員 9 次所收取貨款(元)(X)與其所行駛里程(公尺)(Y)之間的關係，其資料如下：

X	3450	2650	4820	5760	3720	4365	5860	6620	5160
Y	1743	1190	2672	3236	1878	2302	3343	3678	2865

   (1) 試求迴歸直線 $\hat{Y} = \hat{\alpha} + \hat{\beta}X$。(10%)

   (2) 請以5%之顯著水準檢定此迴歸模型是否合適。 (15%)

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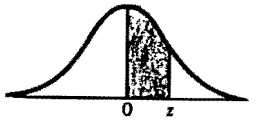
系所：運籌所
科目：統計學(2)

7. 下表是某知名 NBA 籃球選手之 2012 年球季目前的出賽記錄，請檢定其出賽時間 30 分鐘以上與不到 30 分鐘的投籃命中率與得分是否有差異，並請說明檢定時所需之條件，$\alpha=0.05$。(25%)

出賽日期	對手	出賽時間	投籃(命中-出手)	得分
2/23	熱火	34	1-11	8
2/22	老鷹	32	6-11	17
2/20	籃網	36	7-18	21
2/19	小牛	46	11-20	28
2/17	黃蜂	40	8-18	26
2/15	國王	26	4-6	10
2/14	暴龍	43	9-20	27
2/11	灰狼	39	8-24	20
2/10	湖人	39	13-23	38
2/08	巫師	36	9-14	23
2/06	爵士	45	10-17	28
2/04	籃網	36	10-19	25
2/03	塞爾蒂克	7	0-3	2
1/31	活塞	6	1-1	4
1/28	火箭	20	3-9	9
1/24	山貓	6	2-2	8
1/14	雷霆	5	1-1	3
1/07	活塞	4	1-1	4
12/31	國王	4	0-1	0
12/29	湖人	2	0-1	2
12/28	勇士	1	0-1	0

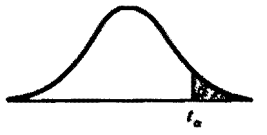
TABLE 3 *Normal Curve Areas*



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

This table is abridged from Table 1 of *Statistical Tables and Formulas*, by A. Hald (New York: John Wiley & Sons, Inc., 1952). Reproduced by permission of A. Hald and the publishers, John Wiley & Sons, Inc.

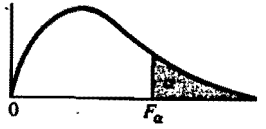
TABLE 4 *Critical Values of t*



$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	d.f.
3.078	6.314	12.706	31.821	63.657	1
1.886	2.920	4.303	6.965	9.925	2
1.638	2.353	3.182	4.541	5.841	3
1.533	2.132	2.776	3.747	4.604	4
1.476	2.015	2.571	3.365	4.032	5
1.440	1.943	2.447	3.143	3.707	6
1.415	1.895	2.365	2.998	3.499	7
1.397	1.860	2.306	2.896	3.355	8
1.383	1.833	2.262	2.821	3.250	9
1.372	1.812	2.228	2.764	3.169	10
1.363	1.796	2.201	2.718	3.106	11
1.356	1.782	2.179	2.681	3.055	12
1.350	1.771	2.160	2.650	3.012	13
1.345	1.761	2.145	2.624	2.977	14
1.341	1.753	2.131	2.602	2.947	15
1.337	1.746	2.120	2.583	2.921	16
1.333	1.740	2.110	2.567	2.898	17
1.330	1.734	2.101	2.552	2.878	18
1.328	1.729	2.093	2.539	2.861	19
1.325	1.725	2.086	2.528	2.845	20
1.323	1.721	2.080	2.518	2.831	21
1.321	1.717	2.074	2.508	2.819	22
1.319	1.714	2.069	2.500	2.807	23
1.318	1.711	2.064	2.492	2.797	24
1.316	1.708	2.060	2.485	2.787	25
1.315	1.706	2.056	2.479	2.779	26
1.314	1.703	2.052	2.473	2.771	27
1.313	1.701	2.048	2.467	2.763	28
1.311	1.699	2.045	2.462	2.756	29
1.282	1.645	1.960	2.326	2.576	inf.

From "Table of Percentage Points of the *t*-Distribution." Computed by Maxine Merrington, *Biometrika*, Vol. 32 (1941), p. 300. Reproduced by permission of Professor E. S. Pearson.

TABLE 6 Percentage Points of the F Distribution; $\alpha = .05$



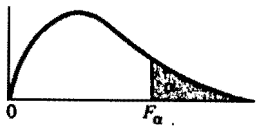
	ν_1 (d.f.)								
ν_2 (d.f.)	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
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	2.43	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	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

TABLE 6 (Continued)

ν_1 (d.f.)											
10	12	15	20	24	30	40	60	120	∞	ν_2 (d.
241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3	1
19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50	2
8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53	3
5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	4
4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36	5
4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67	6
3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	7
3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	8
3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	9
2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	10
2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	11
2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	12
2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	13
2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	14
2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	15
2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	16
2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	17
2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	18
2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	19
2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	20
2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	21
2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	22
2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76	23
2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73	24
2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	25
2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	26
2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	27
2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65	28
2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	29
2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	30
2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	40
1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	60
1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25	120
1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00	∞

From "Tables of Percentage Points of the Inverted Beta (F) Distribution," *Biometrika*, Vol. 33 (194 pp. 73–88, by Maxine Merrington and Catherine M. Thompson. Reproduced by permission of Profess E. S. Pearson.

TABLE 7 Percentage Points of the F Distribution; α = .01



	ν_1 (d.f.)								
ν_2 (d.f.)	1	2	3	4	5	6	7	8	9
1	4052	4999.5	5403	5625	5764	5859	5928	5982	6022
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41

TABLE 7 (Continued)

ν_1 (d.f.)											
10	12	15	20	24	30	40	60	120	∞	ν_2 (d.
6056	6106	6157	6209	6235	6261	6287	6313	6339	6366	1
99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.50	2
27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.13	3
14.55	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46	4
10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02	5
7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88	6
6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65	7
5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86	8
5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31	9
4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91	10
4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60	11
4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36	12
4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17	13
3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00	14
3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87	15
3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75	16
3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65	17
3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57	18
3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49	19
3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42	20
3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36	21
3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31	22
3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26	23
3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21	24
3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17	25
3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13	26
3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10	27
3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06	28
3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03	29
2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01	30
2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80	40
2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60	60
2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38	120
2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00	∞

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