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| 考試科目 | 經濟學 A | 系所別 | 經濟學系三年級 | 考試時間 | 7 月 5 日(三)第 2 節 |
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- 試繪圖說明在資訊充分情形下，為何由供需雙方決定的市場均衡價格與交易量會帶來社會福利的最大？(10%)
- 經濟發展帶來所得的持續提高，試回答以下問題。(20%)
 - 如果小說是正常財 (normal goods)，隨著個人所得的提高，個人的小說消費量未能增加的原因為何？(5%)
 - 如果小孩是一種正常財，隨著經濟發展家庭所得提高，生育率應該會持上升，但卻出現生育率不升反下降的情況，可能的原因有哪些？(5%)
 - 低生育率對一國經濟長期會有何影響？政府為提高生育率，除了補貼獎勵生育外，還有哪些應對的政策措施？(10%)
- 何謂資訊的不對稱 (asymmetric information)，試舉例說明？通常會出現哪兩種現象？其均衡解為何有經濟效率損失，以所舉的例子說明之？(10%)
- 何謂公共財 (public goods)，有何特色？何謂共有財 (common goods)，有何特色？這兩種財貨有何區別？又各會產生什麼問題？可以如何來解決？試各舉一例說明 (20%)
- 試以 AD-AS 模型，分別說明新冠疫情肆虐對總體經濟，包括產出、消費、就業與物價的影響。(10%)
- 試以 AD-AS 模型，分別說明俄烏戰爭對總體經濟的短期與長期影響，包括產出、消費、就業與物價。(10%)
- 當目前總產出在自然產出水準時，因為價格水準太高，政府為打擊通貨膨脹，採取緊縮性的貨幣政策，試以 AD-AS 模型，分別說明在調適性預期 (adaptive expectations) 或理性預期 (rational expectations) 下，如何影響物價水準和總體產出？(20%)

備註

- 作答於試題上者，不予計分。
- 試題請隨卷繳交。

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A.

Problem 1 Prove or disprove the following statements:

- (8%) If $a_k > 0$ for all $k \in \mathbb{N}$ and $\lim_{n \rightarrow \infty} a_n = 0$, then the series $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$ is convergent.
- (8%) The series $\sum_{n=1}^{\infty} \ln\left(\frac{n^2}{n^2+1}\right)$ is convergent.
- (8%) Let $f(x, y) = \frac{xy \sin y}{3x^2 + y^2}$ if $(x, y) \neq (0, 0)$ and $f(x, y) = 0$ if $(x, y) = (0, 0)$. Then f is continuous at $(0, 0)$.

Problem 2 (8%) Evaluate the following integral

$$\int_0^1 \left(\int_{\sqrt{y}}^1 e^{x^3} dx \right) dy.$$

Problem 3 (8%) Find the extreme value of $f(x, y) = x^2 + y^2 - 3x - xy$ subject to $x^2 + y^2 \leq 9$

Problem 4 (10%) Find the Maclaurin series of $f(x) = \frac{1}{\sqrt[4]{16-x}}$ and the associated radius of convergence.

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註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

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B.

1. (24pt) Short questions, you just need to give the final answer in each part.

(此大題請直接填寫答案，不需要提供過程說明)

a. (3pt) $\lim_{x \rightarrow \infty} \left(1 + \frac{2}{x}\right)^{5x}$

b. (3pt) $f(x) = x \ln(x), x > 0$. Find minimum value of $f(x)$

c. (3pt) $f(x)$ is differentiable and $xf(x) + f(x^2) = 2$ for $x > 0$. Find $f'(1)$

d. (3pt) Find $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 1}{x+2}\right)^{1/x}$

e. (6pt) $f(x) = \frac{x + x \cos(x)}{\sin(x) \cos(x)}$. Find $\lim_{x \rightarrow 0} f(x)$

f. (6pt) $f(x) = \frac{x + \sin(x) + 2\sqrt{x}}{x + \sin(x)}$. Find $\lim_{x \rightarrow \infty} f(x)$

以下兩題請提供過程說明

2. (14pt) Let $f(x)$ be a positive function for $x \geq 0$ and $M(t) = \int_0^{\infty} e^{tx} f(x) dx$. Suppose that the interchange of the differentiation and integration is valid, and $M(0) = 1, M'(0) = 0, M''(0) = 1$.

Show that $\lim_{n \rightarrow \infty} \left\{M\left(\frac{t}{\sqrt{n}}\right)\right\}^n = e^{t^2/2}$.

3. (12pt) Let $S(a, b) = \sum_i (y_i - a - bx_i)^2$, where $\sum_i x_i^2 = n, \sum_i x_i = n/2$.

(a) (6pt) Let (a_1, b_1) be the minimizer of $S(a, b)$. Find (a_1, b_1)

(b) (6pt) Under the constraint $a+b=c$, find the minimizer of $S(a, b)$ in terms of (a_1, b_1) and c .

Ps., y_i is a known number for $i=1, 2, \dots, n$.

備註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

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選擇題請在答案卡上作答，否則不予計分。

單選題，共 100 題，每題 1 分

- The purpose of making assumptions in economic model building is to
 - force the model to yield the correct answer.
 - minimize the amount of work an economist must do.
 - simplify the model while keeping important details.
 - express the relationship mathematically.
- Which of the following is a positive statement?
 - When the price of a good goes up, consumers buy less of it.
 - When the price of a good goes up, firms produce more of it.
 - When the Federal government sells bonds, interest rates rise and private investment is reduced.
 - All of the above.
 - None of the above.
- Boeing Corporation and Airbus Industries are the only two producers of long-range commercial aircraft. This market is not perfectly competitive because:
 - Each company has annual sales over \$10 billion.
 - Each company can significantly affect prices.
 - Airbus receives subsidies from the European Union.
 - Airbus cannot sell aircraft to the United States government.
 - All of the above.
- Along any downward sloping straight-line demand curve:
 - both the price elasticity and slope vary.
 - the price elasticity varies, but the slope is constant.
 - the slope varies, but the price elasticity is constant.
 - both the price elasticity and slope are constant.
- Suppose the demand for gourmet coffee can be represented by a linear demand curve. At the prevailing market price the income elasticity of demand for gourmet coffee is 2. When income rises the demand curve for gourmet coffee:
 - becomes less elastic at every price.
 - becomes less elastic at the price that prevailed before the change in income
 - becomes more elastic at every price

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- D) becomes more elastic at the price that prevailed before the change in income
6. Consider a supply curve of the form: $Q = c + dP$. If d equals zero then supply is:
- A) completely inelastic.
 - B) inelastic, but not completely inelastic.
 - C) elastic, but not infinitely elastic.
 - D) infinitely elastic
7. If indifference curves are concave to the origin, which assumption on preferences is violated?
- A) Diminishing marginal rates of substitution.
 - B) Transitivity of preferences.
 - C) More is preferred to less.
 - D) Completeness.
8. If prices and income in a two-good society double, what will happen to the budget line?
- A) The intercepts of the budget line will increase.
 - B) The intercepts of the budget line will decrease.
 - C) The slope of the budget line may either increase or decrease.
 - D) Insufficient information is given to determine what effect the change will have on the budget line but we know society is worse-off.
 - E) There will be no effect on the budget line.
9. When Joe maximizes utility, he finds that his MRS of X for Y is greater than P_x/P_y . It is most likely that:
- A) Joe's preferences are incomplete.
 - B) Joe's preferences are irrational.
 - C) Joe is not consuming good X.
 - D) Joe is not consuming good Y.
10. Assume that beer is a normal good. If the price of beer rises, then the substitution effect results in the person buying _____ of the good and the income effect results in the person buying _____ of the good.
- A) more, more
 - B) more, less
 - C) less, more
 - D) less, less

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11. What is the shape of the marginal revenue curve derived from a linear downward sloping demand curve?
- A) Horizontal.
 - B) Vertical.
 - C) U-shaped.
 - D) Downward sloping, with a constant slope.
12. When negative network externalities are present
- A) the demand curve is more elastic than otherwise.
 - B) the demand curve is less elastic than otherwise.
 - C) the demand curve shifts to the right.
 - D) the demand curve shifts to the left.
13. Other things equal, expected income can be used as a direct measure of well-being
- A) always.
 - B) no matter what a person's preference to risk.
 - C) if and only if individuals are not risk-loving.
 - D) if and only if individuals are risk averse.
 - E) if and only if individuals are risk neutral.
14. John Brown's utility of income function is $U = \log(I+1)$, where I represents income. From this information you can say that
- A) John Brown is risk neutral.
 - B) John Brown is risk loving.
 - C) John Brown is risk averse.
 - D) we need more information before we can determine John Brown's preference for risk.
15. The indifference curve between expected return and the standard deviation of return for a risk-averse investor
- A) is downward-sloping.
 - B) is upward-sloping.
 - C) is horizontal.
 - D) is vertical.
 - E) can take any shape.

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| <p>16. When the average product is decreasing, marginal product</p> <ul style="list-style-type: none">A) equals average product.B) is increasing.C) exceeds average product.D) is decreasing.E) is less than average product. <p>17. Two isoquants, which represent different output levels but are derived from the same production function, cannot cross because</p> <ul style="list-style-type: none">A) isoquants represent different utility levelsB) this would violate a transitivity conditionC) isoquants are downward slopingD) additional inputs will not be used by profit maximizing firms if those inputs decrease outputE) both (b) and (d) are true <p>18. With increasing returns to scale, isoquants for unit increases in output become</p> <ul style="list-style-type: none">A) farther and farther apart.B) closer and closer together.C) the same distance apart.D) none of these. <p>19. For any given level of output:</p> <ul style="list-style-type: none">A) marginal cost must be greater than average cost.B) average variable cost must be greater than average fixed cost.C) average fixed cost must be greater than average variable cost.D) fixed cost must be greater than variable cost.E) none of the above is necessarily correct. <p>20. At the current level of output, long-run marginal cost is \$50 and long-run average cost is \$75. This implies that:</p> <ul style="list-style-type: none">A) there are neither economies nor diseconomies of scale.B) there are economies of scale.C) there are diseconomies of scale.D) the cost-output elasticity is greater than one. <p>21. A variable cost function of the form: $VC = 23 + Q + 7Q^2$ implies a marginal cost curve that is</p> | | | | | |

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| <p>A) linear. B) downward sloping. C) U-shaped. D) quadratic.</p> <p>22. At the profit-maximizing level of output, marginal profit</p> <p>A) is also maximized. B) is zero. C) is positive. D) is increasing. E) may be positive, negative or zero.</p> <p>23. In the short run, a perfectly competitive firm earning negative economic profit is</p> <p>A) on the downward-sloping portion of its ATC curve. B) at the minimum of its ATC curve. C) on the upward-sloping portion of its ATC curve. D) above its ATC curve.</p> <p>24. In long-run competitive equilibrium, a firm that owns factors of production will have an</p> <p>A) economic profit = \$0 and accounting profit > \$0. B) economic profit > \$0 and accounting profit = \$0. C) economic and accounting profit = \$0. D) economic and accounting profit > \$0. E) economic and accounting profit can take any value.</p> <p>25. Compared to a tariff, an import quota, which restricts imports to the same amount as the tariff, will leave the country as a whole</p> <p>A) not as bad off as a comparable tariff. B) worse off than a comparable tariff. C) about the same as a comparable tariff. D) any of the above can be true.</p> <p>26. The burden of a tax per unit of output will fall heavily on consumers when demand is relatively _____ and supply is relatively _____.</p> <p>A) inelastic; elastic B) inelastic; inelastic</p> | | | | | |

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- C) elastic; elastic
- D) elastic; inelastic

27. Which of the following is NOT true about price floors?

- A) Consumer surplus is always lower than it would be in the competitive equilibrium.
- B) Producer surplus could be lower, higher, or the same as it would be in competitive equilibrium.
- C) Producer surplus could be negative as the result of a price floor.
- D) Producers will often respond to a price floor by cutting production to the point at which price equals marginal cost.
- E) The total producer surplus depends on how producers respond to the price floor in determining their output level.

28. If a monopolist sets her output such that marginal revenue, marginal cost and average total cost are equal, economic profit must be:

- A) negative.
- B) positive.
- C) zero.
- D) indeterminate from the given information.

29. The Lerner index measures

- A) a firm's potential monopoly power.
- B) the amount of monopoly power a firm chooses to exercise when maximizing profits.
- C) a firm's potential profitability.
- D) an industry's potential market power.

30. Predatory pricing is defined to be

- A) collusive pricing.
- B) cooperative behavior between two firms with monopoly power.
- C) behavior designed to drive out current competition.
- D) collusion.

31. You are the producer of stereo components. There are two markets, foreign and domestic. The two groups of consumers cannot trade with one another. You will charge the higher price in the market with the

- A) lower own price elasticity of demand (more inelastic demand).
- B) higher own price elasticity of demand (more elastic demand).

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| <p>C) larger teenage population. D) greater consumer incomes.</p> <p>32. When a monopolist engages in perfect price discrimination, A) the marginal revenue curve lies below the demand curve. B) the demand curve and the marginal revenue curve are identical. C) marginal cost becomes zero. D) the marginal revenue curve becomes horizontal.</p> <p>33. A firm setting a two-part tariff with only one customer should set the entry fee equal to A) marginal cost. B) consumer surplus. C) marginal revenue. D) price.</p> <p>34. Which of the following is true in long run equilibrium for a firm in monopolistic competition? A) $MC=ATC$. B) $MC>ATC$. C) $MC<ATC$. D) Any of the above may be true.</p> <p>35. In the _____, one firm sets its output first, and then a second firm, after observing the first firm's output, makes its output decision. A) Cournot model B) model of monopolistic competition C) Bertrand model D) kinked-demand model E) none of the above</p> <p>36. In the dominant firm model, the fringe firms A) are price takers. B) maximize profit by equating average revenue and average cost. C) determine their price and output before the dominant firm determines its price and output. D) all of the above. E) none of the above.</p> | | | | | |

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37. A Nash equilibrium occurs when
- A) each firm is doing the best it can given its opponents' actions.
 - B) each firm chooses the strategy that maximizes its minimum gain.
 - C) a player can choose a strategy that is optimal regardless of its rivals' actions.
 - D) there is no dominant firm in a market.
38. A "mixed strategy" equilibrium means that
- A) the strategies chosen by the players represent different behaviors.
 - B) one player has a dominant strategy, and one does not.
 - C) one player has a pure strategy, and one does not.
 - D) the equilibrium strategy is an assignment of probabilities to pure strategies.
 - E) the equilibrium strategy involves alternating between a dominant strategy and a Nash strategy.
39. In the sequential version of a game using the same players, the same strategies, and the same possible outcomes as the original game, the equilibrium
- A) may be different than in the original game.
 - B) must be different than in the original game.
 - C) will be the same as in the original game.
 - D) is the same as the cooperative version of the original game.
 - E) is the same as the noncooperative version of the original game.
40. If an individual's labor supply curve is backward bending, then
- A) the income effect associated with a higher wage is greater than the substitution effect.
 - B) the substitution effect associated with a higher wage is greater than the income effect.
 - C) the substitution effect associated with a higher wage encourages more leisure.
 - D) (a) and (c).
 - E) (b) and (c).
41. In a competitive labor market, with one variable factor, the supply of labor to the firm is
- A) equal to the marginal expenditure curve.
 - B) equal to the demand curve for labor.
 - C) greater than the marginal expenditure curve.
 - D) equal to the marginal revenue product curve.
42. Why doesn't the marginal worker hired earn economic rent in a competitive labor market?
- A) His reservation wage is less than the wage.

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- B) His reservation wage is greater than the wage.
C) His reservation wage is equal to the wage.
D) He is paid a wage that is lower than the others.
43. A bond has a current market value of \$800. The holder of the bond will receive a single payment of \$1,000 one year from now. The interest rate is 10 percent. The effective yield on the bond is:
A) \$200.
B) 10 percent.
C) 25 percent.
D) negative.
E) cannot be determined with the information provided.
44. If an asset's beta is high, its
A) diversifiable risk and expected return are high.
B) nondiversifiable risk and expected return are high.
C) diversifiable risk is high; its expected return is low.
D) nondiversifiable risk is high; its expected return is low.
E) total risk is high; its return could be any amount.
45. What is the "Hotelling rule" for a monopolist?
A) Price minus marginal cost must rise at exactly the rate of interest.
B) Price plus marginal cost must rise at exactly the rate of interest.
C) Marginal revenue minus marginal cost must rise at exactly the rate of interest.
D) Marginal revenue and marginal cost must be independent of the rate of interest.
46. In a problem involving exchange, the contract curve shows
A) all exchanges that make both parties better off.
B) the one exchange that makes both parties better off.
C) all possible allocations of goods between both parties.
D) all possible efficient allocations between both parties.
47. Why does perfect competition guarantee a Pareto optimal distribution of goods between two people?
Under perfect competition,
A) everyone has the same preferences.
B) everyone faces the same prices.
C) everyone consumes the same quantity of both goods.

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| <p>D) goods are homogeneous.</p> <p>48. When sellers have more information about products than buyers do, we would expect</p> <ul style="list-style-type: none">A) sellers to get higher prices for their goods than they could otherwise.B) buyers to pay lower prices for goods than they would otherwise.C) high-quality goods to drive low-quality goods out of the market.D) low-quality goods to drive high-quality goods out of the market. <p>49. In the insurance market, "moral hazard" refers to the problem that</p> <ul style="list-style-type: none">A) insurers can't tell high-risk customers from low-risk customers.B) high-risk customers have an incentive to give false signals to make themselves look like low-risk customers.C) companies may unfairly lump individuals together by race, sex, age or other characteristics in an attempt to use demographic data to pinpoint high-risk populations.D) individuals are willing and able to pay different amounts for insurance, but must all be charged the same amount.E) individuals may change their behavior after the insurance is bought, so that they behave in a more high-risk manner than they did before. <p>50. Under a transferable emissions permit system,</p> <ul style="list-style-type: none">A) the firms with the lowest marginal abatement cost curves will reduce emissions most.B) the firms with the highest marginal abatement cost curves will reduce emissions most.C) the firms with the lowest marginal social cost curves will reduce emissions most.D) the firms with the highest marginal social cost curves will reduce emissions most.E) all firms will reduce emissions equally. <p>51. Which of the following is NOT a central issue in macroeconomics?</p> <ul style="list-style-type: none">A) How should the central bank of a country fight inflation?B) What is responsible for high and persistent unemployment?C) How do tax changes influence consumers' choices of what to buy?D) What factors determine economic growth?E) What can or should the government do to stabilize the economy? <p>52. Which of the economists below most likely advocated activist government policies?</p> <ul style="list-style-type: none">A) Milton FriedmanB) John Maynard Keynes | | | | | |

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| <p>C) Robert Lucas D) Thomas Sargent E) Adam Smith</p> <p>53. If we counted the value of autoworkers' salaries, wheels, tires, steel, body parts, and final car sales in calculating GDP, then we would be</p> <p>A) understating GDP by overlooking car dealers' profits B) ignoring the contribution of capital to output C) overstating GDP through double counting D) using the value-added technique for calculating GDP E) calculating GDP correctly only if we excluded any imported cars</p> <p>54. If national income is 5,200, disposable income is 4,400, consumption is 4,100, the trade deficit is 110, and the budget deficit is 150, what is the level of private domestic investment?</p> <p>A) 1,060 B) 540 C) 300 D) 260 E) 40</p> <p>55. Changes in total factor productivity are also called</p> <p>A) the marginal product of labor B) the marginal product of capital C) changes in input costs D) the Cobb-Douglas residual E) the Solow residual</p> <p>56. The idea of a steady state is that</p> <p>A) the capital-labor ratio grows at a constant rate B) output per capita grows at a constant rate C) output, capital, and labor all grow at the same rate D) an increase in the savings rate will not affect the capital-labor ratio E) real output cannot grow</p> <p>57. A production function with constant returns to scale for capital alone implies that</p> <p>A) there are increasing returns to scale for all factors of production taken together</p> | | | | | |

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| <p>B) if all inputs are doubled then output will more than double C) smaller firms are more efficient than larger firms D) technological advances cannot take place E) both A) and B)</p> <p>58. A key assumption in an endogenous growth model with both labor and capital inputs in the production function is that A) the share of capital is larger than the share of labor B) the share of capital and labor have to be equal C) better technology is a byproduct of more capital investment D) there are no external returns to capital E) long-run growth comes solely from technological progress</p> <p>59. Which of the following is FALSE? A) the AS-curve is horizontal in the Keynesian case B) the AS-curve is vertical in the classical case C) the AS-curve is upward sloping in the medium run D) the AS-curve is more price elastic in the long run than in the short run E) none of the above</p> <p>60. In a normal AD-AS diagram with an upward-sloping AS-curve, if the government wanted to maintain a fixed level of output, it would need to respond to a decrease in money supply by A) decreasing government expenditures B) increasing government spending C) urging the Fed to sell bonds in the open market D) increasing income taxes E) decreasing taxes and government spending by the same amount</p> <p>61. The inverse relationship between inflation and unemployment is called A) Okun's law B) the Lucas curve C) the Phillips curve D) the replacement ratio E) the sacrifice ratio</p> <p>62. The most likely long-run result of a tax cut would be</p> | | | | | |

| 考試科目 | 經濟學 B | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三)第二節 |
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| <p>A) lower unemployment but higher prices and interest rates B) lower interest rates but no change in unemployment C) higher levels of consumption, investment, and employment D) more consumption and less investment, with output remaining unchanged E) higher prices and interest rates, resulting in a less consumption and investment</p> <p>63. The Beveridge curve shows a relationship between A) the frequency and the duration of unemployment B) the level of output and the unemployment rate C) job vacancies and the unemployment rate D) job vacancies and the labor force participation rate E) the unemployment rate and alcohol consumption</p> <p>64. Frictional unemployment is A) the unemployment that exists even at the full-employment level of output B) unemployment that results from an increase in the GDP gap C) unemployment that occurs as a result of a supply shock D) the result of discouraged workers leaving the work force E) mostly the result of a high minimum wage rate</p> <p>65. When inflation rises unexpectedly, it is generally the case that A) nominal interest rates and real interest rates will both rise at the same rate B) nominal interest rates will rise while real interest rates will decline C) real interest rates will rise while nominal interest rates will decline D) all nominal wages will immediately be adjusted upwards E) real wages will have to be adjusted upwards</p> <p>66. The redistribution effect that arises from an unanticipated increase in inflation will affect A) insurance contracts B) cash holdings C) people who own fixed rate bonds D) all of the above E) only B) and C)</p> <p>67. An appropriate policy response by a central bank to an increase in the inflation rate is to A) increase bank reserves</p> | | | | | |

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| <p>B) lower the federal funds rate C) buy government bonds from the public D) sell government bonds to the public E) none of the above</p> <p>68. A central bank that follows the Taylor rule</p> <p>A) will not react to economic disturbances until its full effects are felt B) assumes there is no tradeoff between unemployment and inflation C) keeps the growth rate of money supply constant D) sets interest rates based on current economic conditions E) will start selling government bonds as soon as interest rates start to rise</p> <p>69. Assume the consumption function is of the form $C = 200 + (0.75)YD$ and the income tax rate is $t = 0.2$. What would be the effect of an increase in government transfers of 200 ?</p> <p>A) an increase in income of 800 B) an increase in income of 500 C) an increase in income of 375 D) an increase in income of 300 E) an increase in income of 125</p> <p>70. The full-employment budget surplus increases if</p> <p>A) government transfer payments decrease B) welfare spending increases C) defense spending increases D) the economy goes into a recession E) the economy goes into a boom</p> <p>71. We can expect the IS-curve to get steeper, as</p> <p>A) money demand becomes less sensitive to changes in the interest rate B) the marginal propensity to save increases C) investment becomes more sensitive to changes in the interest rate D) the income tax rate decreases E) the expenditure multiplier increases</p> <p>72. In an IS-LM model, any point that is to the left and below the IS-curve indicates a situation where</p> <p>A) there is excess demand for goods and services in the expenditure sector</p> | | | | | |

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B) there is excess supply of goods and services in the expenditure sector
C) the expenditure sector is in equilibrium but the money sector is not
D) there is excess demand for money in the money sector
E) there is excess supply of money in the money sector

73. Fiscal policy becomes more powerful in changing the level of output as
A) investment becomes more interest elastic
B) money demand becomes more interest inelastic
C) money demand becomes more income elastic
D) the marginal propensity to save gets smaller
E) the marginal propensity to consume gets smaller

74. A policy mix designed to promote increased investment spending by firms might involve
A) open market sales combined with income tax cuts
B) a government spending increase financed by a tax increase
C) cuts in government purchases combined with higher investment tax credits
D) an increase in government purchases combined with monetary restriction
E) removal of investment subsidies

75. If a country has a balance-of-payments surplus, we know for sure that
A) the current account shows a surplus
B) the capital account shows a surplus
C) the sum of the current and capital accounts shows a surplus
D) net exports are positive
E) all of the above have to be true

76. In a flexible exchange rate system with perfect capital mobility
A) expansionary monetary policy will appreciate the domestic currency
B) fiscal expansion is very effective in stimulating aggregate demand
C) fiscal expansion causes a depreciation of the domestic currency
D) the domestic interest rate can't substantially deviate from the world interest rate for very long
E) all of the above

77. According to the permanent-income theory of consumption
A) permanent income is always lower than transitory income
B) the mpc out permanent income is close to zero

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| 考試科目 | 經濟學 B | 系所別 | 經濟學系三年級 | 考試時間 | 17月5日(三)第二節 |
| <p>C) the mpc out of transitory income is close to 1 D) all of the above E) none of the above</p> <p>78. The Barro-Ricardo equivalence proposition relies on A) the presence of an operational bequest motive B) the absence of liquidity constraints C) the presence of liquidity constraints D) both A) and B) E) both A) and C)</p> <p>79. Assume a Cobb-Douglas production function in which the share of capital is $a = 1/4$ and the share of labor is $b = 3/4$. In this case, the marginal product of capital is A) $Y/3K$ B) $3Y/4K$ C) $Y/4K$ D) $3Y/K$ E) $1/4$</p> <p>80. If Tobin's q is greater than 1, then a firm should A) lower its desired capital stock B) issue more stocks to finance new capital investment C) pay out more dividends to stockholders D) borrow more funds from banks to finance new capital investment E) lower its level of investment spending</p> <p>81. Which of the following functions does money NOT serve very well? A) as a unit of account B) as a standard of deferred payment C) as a protection against high inflation D) as a store of value E) as a medium of exchange</p> <p>82. From the Baumol-Tobin transaction demand model, we can derive that the A) the interest elasticity of money demand is -1 B) income elasticity of money demand is +1</p> | | | | | |

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- C) the interest elasticity of money demand is $-1/2$
- D) income elasticity of money demand is $+1/2$
- E) both C) and D)

83. High-powered money

- A) earns more interest than other forms of money
- B) consists of currency held by the public and bank reserves
- C) consists of currency held by the public and demand deposits at banks
- D) includes time and demand deposits held at banks
- E) is created whenever the Fed sells government bonds

84. If the currency-deposit ratio is 23% and the reserve-deposit ratio is 7%, the size of the money multiplier is

- A) 0.3
- B) 2.0
- C) 3.0
- D) 3.3
- E) 4.1

85. Automatic stabilizers

- A) prolong the inside lag but reduce the outside lag
- B) mitigate the multiplier effect of disturbances on aggregate demand
- C) render any active fiscal policy unnecessary
- D) work when there is a demand disturbance but not when there is a supply shock
- E) automatically coordinate fiscal and monetary policy

86. Which of these economists proposed that economic policy should be confined primarily to maintaining a constant long-run money supply growth rate?

- A) Stanley Fischer
- B) Milton Friedman
- C) John Maynard Keynes
- D) Paul Samuelson
- E) John Taylor

87. The term structure of interest rates

- A) is the relationship between interest rates on bonds of different maturities

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| 考試科目 | 經濟學 B | 系所別 | 經濟學系三年級 | 考試時間 | 7 月 5 日(三) 第二節 |
| <p>B) specifies the terms of a bank loan C) specifies the yield on stock holdings D) is the same as compounded interest E) is the same as yield to maturity</p> <p>88. About how much should a financial investment of \$10,000 be worth after three years if it earns a compounded yearly interest of 5%? A) \$10,798 B) \$11,105 C) \$11,384 D) \$11,575 E) \$12,110</p> <p>89. Which of the following statements is TRUE? A) the debt-to-GDP ratio can never exceed 100 percent B) if GDP and the national debt both increase, then the debt-to-GDP ratio cannot change C) whenever the budget deficit increases, the debt-to-GDP ratio also increases D) the debt-to-GDP ratio will always decrease as long as GDP is growing E) none of the above</p> <p>90. Most debt issues by the Treasury are made to A) refinance parts of the national debt that are maturing B) finance entitlement programs C) finance defense spending D) provide more liquidity for financial markets E) monetize the debt</p> <p>91. Which of the following is NOT a monetarist proposition? A) monetary policy is better conducted by a rule than by discretion B) monetary policy affects the economy with long and variable lags C) the Fed should undertake a more active monetary policy D) the private sector is inherently stable E) to conduct monetary policy, money targets are generally better than interest rate targets</p> <p>92. The term seigniorage refers to the government's ability to A) raise revenue by creating money</p> | | | | | |

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| 考試科目 | 經濟學 B | 系所別 | 經濟學系三年級 | 考試時間 | 7 月 5 日(三) 第二節 |
| <p>B) raise revenue by selling government securities to the private sector C) control the central banking system D) raise revenues by raising taxes E) stop hyperinflation by imposing wage and price controls</p> <p>93. The inflation tax revenue is defined as A) the inflation rate plus the growth in the real money base B) the inflation rate minus the growth in the real money base C) the inflation rate minus the real money base D) the inflation rate times the real money base E) the inflation rate times the growth in the real money base</p> <p>94. In order to stop hyperinflation a government can A) introduce new money and ensure that the money growth remains stable B) peg the exchange rate of the new money that is introduced to that of a stable foreign currency C) allow the use of another country's currency as a medium of exchange D) all of the above E) none of the above</p> <p>95. Which of the following is NOT a method of eliminating a current account deficit? A) levying tariffs B) implementing expenditure-switching policies C) implementing expenditure-reducing policies D) subsidizing imports E) reducing government spending</p> <p>96. If real wages are sticky and export demand permanently declines, then A) import prices will fall B) the domestic currency will appreciate C) a recession will result, but it will be short-lived since nominal wages will adjust immediately D) a prolonged period of unemployment will result E) the current account will show a surplus</p> <p>97. A country has an internal and external balance when A) it has a trade surplus and a budget surplus B) the trade balance is zero and the government budget is balanced</p> | | | | | |

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| <p>C) net exports and the inflation rate are both zero D) the trade balance and the unemployment rate are both zero E) the trade balance is zero and output is at the full-employment level</p> <p>98. A country can export inflation when it A) imposes tariffs on imported goods B) engages in expansionary fiscal policies that lead to a currency appreciation C) engages in expansionary monetary policies that lead to a currency appreciation D) provides export subsidies to domestic industries E) imposes tariffs and employs expansionary monetary policies</p> <p>99. The rational expectations equilibrium approach A) is supported by the insider-outsider model B) believes that markets clear very rapidly C) implies that deviations from full employment can be long in duration D) implies that unanticipated money supply changes have no real effect on output E) all of the above</p> <p>100. According to the real business cycle theory, a decrease in labor productivity will A) increase both prices and output B) decrease both prices and output C) increase prices and decrease output D) decrease prices and increase output E) have no effect on prices or output</p> | | | | | |
| 備註 | 一、作答於試題上者，不予計分。 二、試題請隨卷繳交。 | | | | |

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| 考試科目 | 統計學 | 系所別 | 經濟學系 三級 | 考試時間 | 7月5日(三) 第四節 |
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1. (20%) It is claimed that in a bushel of peaches, fewer than 10% are defective. A sample of 400 peaches is examined and 50 are found to be defective. If $\alpha = 0.025$, what is your conclusion regarding the claim? State clearly the null and alternate hypothesis, the test statistic, decision rule (critical value) and decision.

2. (20%) Consider the multiple regression model shown next between the dependent variable Y and four independent variables X_1, X_2, X_3 , and X_4 , which result in the following function:

$$\hat{Y} = 33 + 8X_1 - 6X_2 + 16X_3 + 18X_4$$

For this model, there were 35 observations; $SSR = 1,400$ and $SSE = 600$. Assume a 0.01 significance level. Perform a global test of hypothesis to check if any of the regression coefficients are different from 0. State clearly the null and alternate hypothesis, the test statistic, decision rule (critical value) and decision.

3. (20%) Using the following information to test the hypothesis $H_0: \rho = 0$, with a level of significance set at 0.05. State clearly the test statistic, decision rule and decision.

| | Coefficients |
|----------------------|--------------|
| Intercept | -12.8094 |
| Independent variable | 2.1794 |

| ANOVA | | | | |
|------------|-----------|-----------|-----------|----------|
| | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i> |
| Regression | 1 | 12323.56 | 12323.56 | 90.0481 |
| Residual | 8 | 1094.842 | 136.8550 | |
| Total | 9 | 13418.4 | | |

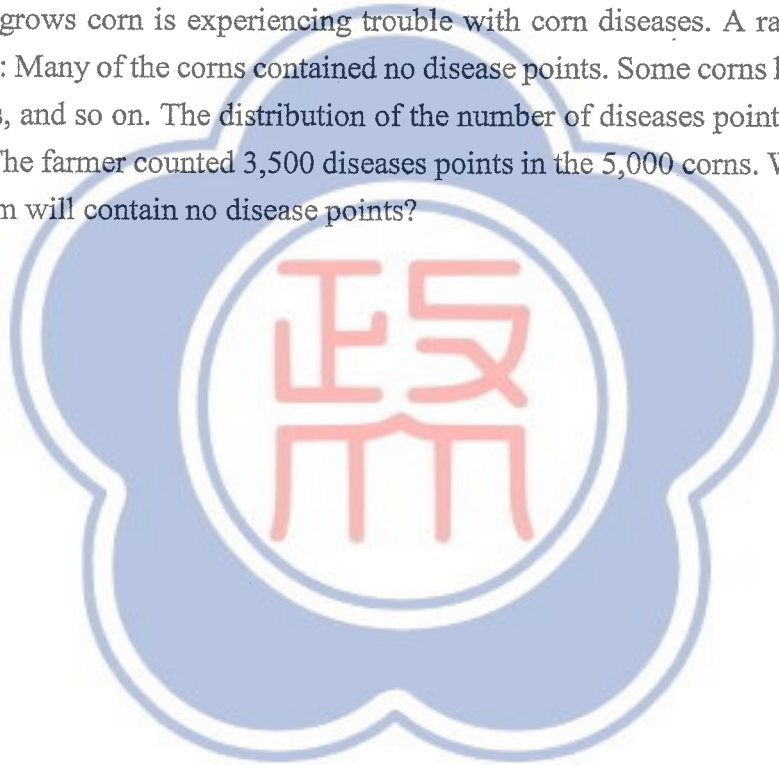
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| 考試科目 | 統計學 | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三)第四節 |
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4. (20%) Two accounting professors decided to compare the variance of their grading procedures. To accomplish this, they each graded the same 10 exams, with the following results:

| | Mean Grade | Standard Deviation |
|-------------|------------|--------------------|
| Professor 1 | 79.3 | 22.4 |
| Professor 2 | 82.1 | 12.0 |

At the 2% level of significance, what is the decision? State clearly the null and alternate hypothesis, the test statistic, decision rule (critical value) and decision.

5. (20%) A farmer who grows corn is experiencing trouble with corn diseases. A random check of 5,000 corns revealed the following: Many of the corns contained no disease points. Some corns had one disease point. A few had two disease points, and so on. The distribution of the number of diseases points per corn approximated the Poisson distribution. The farmer counted 3,500 diseases points in the 5,000 corns. What is the probability that a corn selected at random will contain no disease points?



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B.3 Areas under the Normal Curve

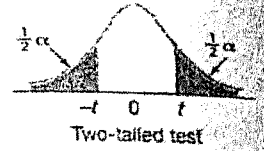
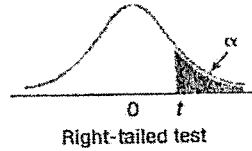
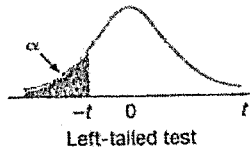
Example:
If $z = 1.96$, then
 $P(0 \text{ to } z) = 0.4750$.



| z | 0.00 | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 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 | 0.4915 |
| 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 |

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B.5 Student's t Distribution



| Confidence Intervals, c | | | | | | | Confidence Intervals, c | | | | | | |
|-------------------------|---|-------|--------|--------|--------|---------|-------------------------|---|-------|-------|-------|-------|--------|
| df | 80% | 90% | 95% | 98% | 99% | 99.9% | df | 80% | 90% | 95% | 98% | 99% | 99.9% |
| | Level of Significance for One-Tailed Test, α | | | | | | | Level of Significance for One-Tailed Test, α | | | | | |
| | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.0005 | | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.0005 |
| | Level of Significance for Two-Tailed Test, α | | | | | | | Level of Significance for Two-Tailed Test, α | | | | | |
| | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.001 | | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.001 |
| 1 | 3.078 | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 | 36 | 1.306 | 1.688 | 2.028 | 2.434 | 2.719 | 3.582 |
| 2 | 1.886 | 2.920 | 4.303 | 6.965 | 9.925 | 31.598 | 37 | 1.305 | 1.687 | 2.026 | 2.431 | 2.715 | 3.574 |
| 3 | 1.638 | 2.353 | 3.182 | 4.541 | 5.841 | 12.924 | 38 | 1.304 | 1.686 | 2.024 | 2.429 | 2.712 | 3.566 |
| 4 | 1.533 | 2.132 | 2.776 | 3.747 | 4.804 | 8.610 | 39 | 1.304 | 1.685 | 2.023 | 2.426 | 2.708 | 3.558 |
| 5 | 1.476 | 2.015 | 2.571 | 3.365 | 4.032 | 6.869 | 40 | 1.303 | 1.684 | 2.021 | 2.423 | 2.704 | 3.551 |
| 6 | 1.440 | 1.943 | 2.447 | 3.143 | 3.707 | 5.959 | 41 | 1.303 | 1.683 | 2.020 | 2.421 | 2.701 | 3.544 |
| 7 | 1.415 | 1.895 | 2.365 | 2.998 | 3.499 | 5.408 | 42 | 1.302 | 1.682 | 2.018 | 2.418 | 2.698 | 3.538 |
| 8 | 1.397 | 1.860 | 2.306 | 2.896 | 3.355 | 5.041 | 43 | 1.302 | 1.681 | 2.017 | 2.416 | 2.695 | 3.532 |
| 9 | 1.383 | 1.833 | 2.262 | 2.821 | 3.250 | 4.781 | 44 | 1.301 | 1.680 | 2.015 | 2.414 | 2.692 | 3.526 |
| 10 | 1.372 | 1.812 | 2.228 | 2.764 | 3.169 | 4.587 | 45 | 1.301 | 1.679 | 2.014 | 2.412 | 2.690 | 3.520 |
| 11 | 1.363 | 1.796 | 2.201 | 2.718 | 3.106 | 4.437 | 46 | 1.300 | 1.679 | 2.013 | 2.410 | 2.687 | 3.515 |
| 12 | 1.356 | 1.782 | 2.179 | 2.681 | 3.055 | 4.318 | 47 | 1.300 | 1.678 | 2.012 | 2.408 | 2.685 | 3.510 |
| 13 | 1.350 | 1.771 | 2.160 | 2.650 | 3.012 | 4.221 | 48 | 1.299 | 1.677 | 2.011 | 2.407 | 2.682 | 3.505 |
| 14 | 1.345 | 1.761 | 2.145 | 2.624 | 2.977 | 4.140 | 49 | 1.299 | 1.677 | 2.010 | 2.405 | 2.680 | 3.500 |
| 15 | 1.341 | 1.753 | 2.131 | 2.602 | 2.947 | 4.073 | 50 | 1.299 | 1.676 | 2.009 | 2.403 | 2.678 | 3.496 |
| 16 | 1.337 | 1.746 | 2.120 | 2.583 | 2.921 | 4.015 | 51 | 1.298 | 1.675 | 2.008 | 2.402 | 2.676 | 3.492 |
| 17 | 1.333 | 1.740 | 2.110 | 2.567 | 2.898 | 3.965 | 52 | 1.298 | 1.675 | 2.007 | 2.400 | 2.674 | 3.488 |
| 18 | 1.330 | 1.734 | 2.101 | 2.552 | 2.878 | 3.922 | 53 | 1.298 | 1.674 | 2.006 | 2.399 | 2.672 | 3.484 |
| 19 | 1.328 | 1.729 | 2.093 | 2.539 | 2.861 | 3.883 | 54 | 1.297 | 1.674 | 2.005 | 2.397 | 2.670 | 3.480 |
| 20 | 1.325 | 1.725 | 2.086 | 2.528 | 2.845 | 3.850 | 55 | 1.297 | 1.673 | 2.004 | 2.396 | 2.668 | 3.476 |
| 21 | 1.323 | 1.721 | 2.080 | 2.518 | 2.831 | 3.819 | 56 | 1.297 | 1.673 | 2.003 | 2.395 | 2.667 | 3.473 |
| 22 | 1.321 | 1.717 | 2.074 | 2.508 | 2.819 | 3.792 | 57 | 1.297 | 1.672 | 2.002 | 2.394 | 2.665 | 3.470 |
| 23 | 1.319 | 1.714 | 2.069 | 2.500 | 2.807 | 3.768 | 58 | 1.296 | 1.672 | 2.002 | 2.392 | 2.663 | 3.466 |
| 24 | 1.318 | 1.711 | 2.064 | 2.492 | 2.797 | 3.745 | 59 | 1.296 | 1.671 | 2.001 | 2.391 | 2.662 | 3.463 |
| 25 | 1.316 | 1.708 | 2.060 | 2.485 | 2.787 | 3.725 | 60 | 1.296 | 1.671 | 2.000 | 2.390 | 2.660 | 3.460 |
| 26 | 1.315 | 1.706 | 2.056 | 2.479 | 2.779 | 3.707 | 61 | 1.296 | 1.670 | 2.000 | 2.389 | 2.659 | 3.457 |
| 27 | 1.314 | 1.703 | 2.052 | 2.473 | 2.771 | 3.690 | 62 | 1.295 | 1.670 | 1.999 | 2.388 | 2.657 | 3.454 |
| 28 | 1.313 | 1.701 | 2.048 | 2.467 | 2.763 | 3.674 | 63 | 1.295 | 1.669 | 1.998 | 2.387 | 2.656 | 3.452 |
| 29 | 1.311 | 1.699 | 2.045 | 2.462 | 2.756 | 3.659 | 64 | 1.295 | 1.669 | 1.998 | 2.386 | 2.655 | 3.449 |
| 30 | 1.310 | 1.697 | 2.042 | 2.457 | 2.750 | 3.646 | 65 | 1.295 | 1.669 | 1.997 | 2.385 | 2.654 | 3.447 |
| 31 | 1.309 | 1.696 | 2.040 | 2.453 | 2.744 | 3.633 | 66 | 1.295 | 1.668 | 1.997 | 2.384 | 2.652 | 3.444 |
| 32 | 1.309 | 1.694 | 2.037 | 2.449 | 2.738 | 3.622 | 67 | 1.294 | 1.668 | 1.996 | 2.383 | 2.651 | 3.442 |
| 33 | 1.308 | 1.692 | 2.035 | 2.445 | 2.733 | 3.611 | 68 | 1.294 | 1.668 | 1.995 | 2.382 | 2.650 | 3.439 |
| 34 | 1.307 | 1.691 | 2.032 | 2.441 | 2.728 | 3.601 | 69 | 1.294 | 1.667 | 1.995 | 2.382 | 2.649 | 3.437 |
| 35 | 1.306 | 1.690 | 2.030 | 2.438 | 2.724 | 3.591 | 70 | 1.294 | 1.667 | 1.994 | 2.381 | 2.648 | 3.435 |

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| 考試科目 | 統計學 | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三)第四節 |
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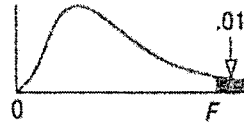
B.5 Student's *t* Distribution (concluded)

| df | Confidence Intervals, <i>c</i> | | | | | |
|----|---|-------|-------|-------|-------|--------|
| | 80% | 90% | 95% | 98% | 99% | 99.9% |
| | Level of Significance for One-Tailed Test, α | | | | | |
| | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.0005 |
| df | Level of Significance for Two-Tailed Test, α | | | | | |
| | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.001 |
| | 71 | 1.294 | 1.667 | 1.994 | 2.380 | 2.647 |
| 72 | 1.293 | 1.666 | 1.993 | 2.379 | 2.646 | 3.431 |
| 73 | 1.293 | 1.666 | 1.993 | 2.379 | 2.645 | 3.429 |
| 74 | 1.293 | 1.666 | 1.993 | 2.378 | 2.644 | 3.427 |
| 75 | 1.293 | 1.665 | 1.992 | 2.377 | 2.643 | 3.425 |
| 76 | 1.293 | 1.665 | 1.992 | 2.376 | 2.642 | 3.423 |
| 77 | 1.293 | 1.665 | 1.991 | 2.376 | 2.641 | 3.421 |
| 78 | 1.292 | 1.665 | 1.991 | 2.375 | 2.640 | 3.420 |
| 79 | 1.292 | 1.664 | 1.990 | 2.374 | 2.640 | 3.418 |
| 80 | 1.292 | 1.664 | 1.990 | 2.374 | 2.639 | 3.416 |
| 81 | 1.292 | 1.664 | 1.990 | 2.373 | 2.638 | 3.415 |
| 82 | 1.292 | 1.664 | 1.989 | 2.373 | 2.637 | 3.413 |
| 83 | 1.292 | 1.663 | 1.989 | 2.372 | 2.636 | 3.412 |
| 84 | 1.292 | 1.663 | 1.989 | 2.372 | 2.636 | 3.410 |
| 85 | 1.292 | 1.663 | 1.988 | 2.371 | 2.635 | 3.409 |
| 86 | 1.291 | 1.663 | 1.988 | 2.370 | 2.634 | 3.407 |
| 87 | 1.291 | 1.663 | 1.988 | 2.370 | 2.634 | 3.406 |
| 88 | 1.291 | 1.662 | 1.987 | 2.369 | 2.633 | 3.405 |

| df | Confidence Intervals, <i>c</i> | | | | | |
|----------|---|-------|-------|-------|-------|--------|
| | 80% | 90% | 95% | 98% | 99% | 99.9% |
| | Level of Significance for One-Tailed Test, α | | | | | |
| | 0.10 | 0.05 | 0.025 | 0.01 | 0.005 | 0.0005 |
| df | Level of Significance for Two-Tailed Test, α | | | | | |
| | 0.20 | 0.10 | 0.05 | 0.02 | 0.01 | 0.001 |
| | 89 | 1.291 | 1.662 | 1.987 | 2.369 | 2.632 |
| 90 | 1.291 | 1.662 | 1.987 | 2.368 | 2.632 | 3.402 |
| 91 | 1.291 | 1.662 | 1.986 | 2.368 | 2.631 | 3.401 |
| 92 | 1.291 | 1.662 | 1.986 | 2.368 | 2.630 | 3.399 |
| 93 | 1.291 | 1.661 | 1.986 | 2.367 | 2.630 | 3.398 |
| 94 | 1.291 | 1.661 | 1.986 | 2.367 | 2.629 | 3.397 |
| 95 | 1.291 | 1.661 | 1.985 | 2.366 | 2.629 | 3.396 |
| 96 | 1.290 | 1.661 | 1.985 | 2.366 | 2.628 | 3.395 |
| 97 | 1.290 | 1.661 | 1.985 | 2.365 | 2.627 | 3.394 |
| 98 | 1.290 | 1.661 | 1.984 | 2.365 | 2.627 | 3.393 |
| 99 | 1.290 | 1.660 | 1.984 | 2.365 | 2.626 | 3.392 |
| 100 | 1.290 | 1.660 | 1.984 | 2.364 | 2.626 | 3.390 |
| 120 | 1.289 | 1.658 | 1.980 | 2.358 | 2.617 | 3.373 |
| 140 | 1.288 | 1.656 | 1.977 | 2.353 | 2.611 | 3.361 |
| 160 | 1.287 | 1.654 | 1.975 | 2.350 | 2.607 | 3.352 |
| 180 | 1.286 | 1.653 | 1.973 | 2.347 | 2.603 | 3.345 |
| 200 | 1.286 | 1.653 | 1.972 | 2.345 | 2.601 | 3.340 |
| ∞ | 1.282 | 1.645 | 1.960 | 2.326 | 2.576 | 3.291 |

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| 考試科目 | 統計學 | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三) 第四節 |
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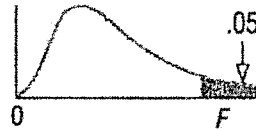
B.6B Critical Values of the F Distribution ($\alpha = .01$)



| | | Degrees of Freedom for the Numerator | | | | | | | | | | | | | | | |
|--|------|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 15 | 20 | 24 | 30 | 40 |
| Degrees of Freedom for the Denominator | 1 | 4052 | 5000 | 5403 | 5625 | 5764 | 5859 | 5928 | 5981 | 6022 | 6056 | 6106 | 6157 | 6209 | 6235 | 6261 | 6287 |
| | 2 | 98.5 | 99.0 | 99.2 | 99.2 | 99.3 | 99.3 | 99.4 | 99.4 | 99.4 | 99.4 | 99.4 | 99.4 | 99.4 | 99.5 | 99.5 | 99.5 |
| | 3 | 34.1 | 30.8 | 29.5 | 28.7 | 28.2 | 27.9 | 27.7 | 27.5 | 27.3 | 27.2 | 27.1 | 26.9 | 26.7 | 26.6 | 26.5 | 26.4 |
| | 4 | 21.2 | 18.0 | 16.7 | 16.0 | 15.5 | 15.2 | 15.0 | 14.8 | 14.7 | 14.5 | 14.4 | 14.2 | 14.0 | 13.9 | 13.8 | 13.7 |
| | 5 | 16.3 | 13.3 | 12.1 | 11.4 | 11.0 | 10.7 | 10.5 | 10.3 | 10.2 | 10.1 | 9.89 | 9.72 | 9.55 | 9.47 | 9.38 | 9.29 |
| | 6 | 13.7 | 10.9 | 9.78 | 9.15 | 8.75 | 8.47 | 8.26 | 8.10 | 7.98 | 7.87 | 7.72 | 7.56 | 7.40 | 7.31 | 7.23 | 7.14 |
| | 7 | 12.2 | 9.55 | 8.45 | 7.85 | 7.46 | 7.19 | 6.99 | 6.84 | 6.72 | 6.62 | 6.47 | 6.31 | 6.16 | 6.07 | 5.99 | 5.91 |
| | 8 | 11.3 | 8.65 | 7.59 | 7.01 | 6.63 | 6.37 | 6.18 | 6.03 | 5.91 | 5.81 | 5.67 | 5.52 | 5.36 | 5.28 | 5.20 | 5.12 |
| | 9 | 10.6 | 8.02 | 6.99 | 6.42 | 6.06 | 5.80 | 5.61 | 5.47 | 5.35 | 5.26 | 5.11 | 4.96 | 4.81 | 4.73 | 4.65 | 4.57 |
| | 10 | 10.0 | 7.56 | 6.55 | 5.99 | 5.64 | 5.39 | 5.20 | 5.06 | 4.94 | 4.85 | 4.71 | 4.56 | 4.41 | 4.33 | 4.25 | 4.17 |
| | 11 | 9.65 | 7.21 | 6.22 | 5.67 | 5.32 | 5.07 | 4.89 | 4.74 | 4.63 | 4.54 | 4.40 | 4.25 | 4.10 | 4.02 | 3.94 | 3.86 |
| | 12 | 9.33 | 6.93 | 5.95 | 5.41 | 5.06 | 4.82 | 4.64 | 4.50 | 4.39 | 4.30 | 4.16 | 4.01 | 3.86 | 3.78 | 3.70 | 3.62 |
| | 13 | 9.07 | 6.70 | 5.74 | 5.21 | 4.86 | 4.62 | 4.44 | 4.30 | 4.19 | 4.10 | 3.96 | 3.82 | 3.66 | 3.59 | 3.51 | 3.43 |
| | 14 | 8.86 | 6.51 | 5.56 | 5.04 | 4.69 | 4.46 | 4.28 | 4.14 | 4.03 | 3.94 | 3.80 | 3.66 | 3.51 | 3.43 | 3.35 | 3.27 |
| | 15 | 8.68 | 6.36 | 5.42 | 4.89 | 4.56 | 4.32 | 4.14 | 4.00 | 3.89 | 3.80 | 3.67 | 3.52 | 3.37 | 3.29 | 3.21 | 3.13 |
| | 16 | 8.53 | 6.23 | 5.29 | 4.77 | 4.44 | 4.20 | 4.03 | 3.89 | 3.78 | 3.69 | 3.55 | 3.41 | 3.26 | 3.18 | 3.10 | 3.02 |
| | 17 | 8.40 | 6.11 | 5.18 | 4.67 | 4.34 | 4.10 | 3.93 | 3.79 | 3.68 | 3.59 | 3.46 | 3.31 | 3.16 | 3.08 | 3.00 | 2.92 |
| | 18 | 8.29 | 6.01 | 5.09 | 4.58 | 4.25 | 4.01 | 3.84 | 3.71 | 3.60 | 3.51 | 3.37 | 3.23 | 3.08 | 3.00 | 2.92 | 2.84 |
| | 19 | 8.18 | 5.93 | 5.01 | 4.50 | 4.17 | 3.94 | 3.77 | 3.63 | 3.52 | 3.43 | 3.30 | 3.15 | 3.00 | 2.92 | 2.84 | 2.76 |
| | 20 | 8.10 | 5.85 | 4.94 | 4.43 | 4.10 | 3.87 | 3.70 | 3.56 | 3.46 | 3.37 | 3.23 | 3.09 | 2.94 | 2.86 | 2.78 | 2.69 |
| | 21 | 8.02 | 5.78 | 4.87 | 4.37 | 4.04 | 3.81 | 3.64 | 3.51 | 3.40 | 3.31 | 3.17 | 3.03 | 2.88 | 2.80 | 2.72 | 2.64 |
| | 22 | 7.95 | 5.72 | 4.82 | 4.31 | 3.99 | 3.76 | 3.59 | 3.45 | 3.35 | 3.26 | 3.12 | 2.98 | 2.83 | 2.75 | 2.67 | 2.58 |
| | 23 | 7.88 | 5.66 | 4.76 | 4.26 | 3.94 | 3.71 | 3.54 | 3.41 | 3.30 | 3.21 | 3.07 | 2.93 | 2.78 | 2.70 | 2.62 | 2.54 |
| | 24 | 7.82 | 5.61 | 4.72 | 4.22 | 3.90 | 3.67 | 3.50 | 3.36 | 3.26 | 3.17 | 3.03 | 2.89 | 2.74 | 2.66 | 2.58 | 2.49 |
| | 25 | 7.77 | 5.57 | 4.68 | 4.18 | 3.85 | 3.63 | 3.46 | 3.32 | 3.22 | 3.13 | 2.99 | 2.85 | 2.70 | 2.62 | 2.54 | 2.45 |
| 30 | 7.56 | 5.39 | 4.51 | 4.02 | 3.70 | 3.47 | 3.30 | 3.17 | 3.07 | 2.98 | 2.84 | 2.70 | 2.55 | 2.47 | 2.39 | 2.30 | |
| 40 | 7.31 | 5.18 | 4.31 | 3.83 | 3.51 | 3.29 | 3.12 | 2.99 | 2.89 | 2.80 | 2.66 | 2.52 | 2.37 | 2.29 | 2.20 | 2.11 | |
| 60 | 7.08 | 4.98 | 4.13 | 3.65 | 3.34 | 3.12 | 2.95 | 2.82 | 2.72 | 2.63 | 2.50 | 2.35 | 2.20 | 2.12 | 2.03 | 1.94 | |
| 120 | 6.85 | 4.79 | 3.95 | 3.48 | 3.17 | 2.96 | 2.79 | 2.66 | 2.56 | 2.47 | 2.34 | 2.19 | 2.03 | 1.95 | 1.86 | 1.76 | |
| ∞ | 6.63 | 4.61 | 3.78 | 3.32 | 3.02 | 2.80 | 2.64 | 2.51 | 2.41 | 2.32 | 2.18 | 2.04 | 1.88 | 1.79 | 1.70 | 1.59 | |

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| 考試科目 | 統計學 | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三) 第四節 |
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B.6A Critical Values of the F Distribution ($\alpha = .05$)

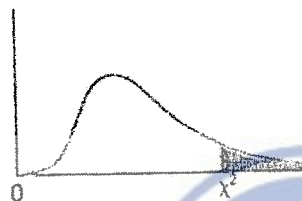


| | | Degrees of Freedom for the Numerator | | | | | | | | | | | | | | | |
|--|------|--------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 15 | 20 | 24 | 30 | 40 |
| Degrees of Freedom for the Denominator | 1 | 161 | 200 | 216 | 225 | 230 | 234 | 237 | 239 | 241 | 242 | 244 | 246 | 248 | 249 | 250 | 251 |
| | 2 | 18.5 | 19.0 | 19.2 | 19.2 | 19.3 | 19.3 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.4 | 19.5 | 19.5 |
| | 3 | 10.1 | 9.55 | 9.28 | 9.12 | 9.01 | 8.94 | 8.89 | 8.85 | 8.81 | 8.79 | 8.74 | 8.70 | 8.66 | 8.64 | 8.62 | 8.59 |
| | 4 | 7.71 | 6.94 | 6.59 | 6.39 | 6.26 | 6.16 | 6.09 | 6.04 | 6.00 | 5.96 | 5.91 | 5.86 | 5.80 | 5.77 | 5.75 | 5.72 |
| | 5 | 6.61 | 5.79 | 5.41 | 5.19 | 5.05 | 4.95 | 4.88 | 4.82 | 4.77 | 4.74 | 4.68 | 4.62 | 4.56 | 4.53 | 4.50 | 4.46 |
| | 6 | 5.99 | 5.14 | 4.76 | 4.53 | 4.39 | 4.28 | 4.21 | 4.15 | 4.10 | 4.06 | 4.00 | 3.94 | 3.87 | 3.84 | 3.81 | 3.77 |
| | 7 | 5.59 | 4.74 | 4.35 | 4.12 | 3.97 | 3.87 | 3.79 | 3.73 | 3.68 | 3.64 | 3.57 | 3.51 | 3.44 | 3.41 | 3.38 | 3.34 |
| | 8 | 5.32 | 4.46 | 4.07 | 3.84 | 3.69 | 3.58 | 3.50 | 3.44 | 3.39 | 3.35 | 3.28 | 3.22 | 3.15 | 3.12 | 3.08 | 3.04 |
| | 9 | 5.12 | 4.26 | 3.86 | 3.63 | 3.48 | 3.37 | 3.29 | 3.23 | 3.18 | 3.14 | 3.07 | 3.01 | 2.94 | 2.90 | 2.86 | 2.83 |
| | 10 | 4.96 | 4.10 | 3.71 | 3.48 | 3.33 | 3.22 | 3.14 | 3.07 | 3.02 | 2.98 | 2.91 | 2.85 | 2.77 | 2.74 | 2.70 | 2.66 |
| | 11 | 4.84 | 3.98 | 3.59 | 3.36 | 3.20 | 3.09 | 3.01 | 2.95 | 2.90 | 2.85 | 2.79 | 2.72 | 2.65 | 2.61 | 2.57 | 2.53 |
| | 12 | 4.75 | 3.89 | 3.49 | 3.26 | 3.11 | 3.00 | 2.91 | 2.85 | 2.80 | 2.75 | 2.69 | 2.62 | 2.54 | 2.51 | 2.47 | 2.43 |
| | 13 | 4.67 | 3.81 | 3.41 | 3.18 | 3.03 | 2.92 | 2.83 | 2.77 | 2.71 | 2.67 | 2.60 | 2.53 | 2.46 | 2.42 | 2.38 | 2.34 |
| | 14 | 4.60 | 3.74 | 3.34 | 3.11 | 2.96 | 2.85 | 2.76 | 2.70 | 2.65 | 2.60 | 2.53 | 2.46 | 2.39 | 2.35 | 2.31 | 2.27 |
| | 15 | 4.54 | 3.68 | 3.29 | 3.06 | 2.90 | 2.79 | 2.71 | 2.64 | 2.59 | 2.54 | 2.48 | 2.40 | 2.33 | 2.29 | 2.25 | 2.20 |
| | 16 | 4.49 | 3.63 | 3.24 | 3.01 | 2.85 | 2.74 | 2.66 | 2.59 | 2.54 | 2.49 | 2.42 | 2.35 | 2.28 | 2.24 | 2.19 | 2.15 |
| | 17 | 4.45 | 3.59 | 3.20 | 2.96 | 2.81 | 2.70 | 2.61 | 2.55 | 2.49 | 2.45 | 2.38 | 2.31 | 2.23 | 2.19 | 2.15 | 2.10 |
| | 18 | 4.41 | 3.55 | 3.16 | 2.93 | 2.77 | 2.66 | 2.58 | 2.51 | 2.46 | 2.41 | 2.34 | 2.27 | 2.19 | 2.15 | 2.11 | 2.06 |
| | 19 | 4.38 | 3.52 | 3.13 | 2.90 | 2.74 | 2.63 | 2.54 | 2.48 | 2.42 | 2.38 | 2.31 | 2.23 | 2.16 | 2.11 | 2.07 | 2.03 |
| | 20 | 4.35 | 3.49 | 3.10 | 2.87 | 2.71 | 2.60 | 2.51 | 2.45 | 2.39 | 2.35 | 2.28 | 2.20 | 2.12 | 2.08 | 2.04 | 1.99 |
| | 21 | 4.32 | 3.47 | 3.07 | 2.84 | 2.68 | 2.57 | 2.49 | 2.42 | 2.37 | 2.32 | 2.25 | 2.18 | 2.10 | 2.05 | 2.01 | 1.96 |
| | 22 | 4.30 | 3.44 | 3.05 | 2.82 | 2.66 | 2.55 | 2.46 | 2.40 | 2.34 | 2.30 | 2.23 | 2.15 | 2.07 | 2.03 | 1.98 | 1.94 |
| | 23 | 4.28 | 3.42 | 3.03 | 2.80 | 2.64 | 2.53 | 2.44 | 2.37 | 2.32 | 2.27 | 2.20 | 2.13 | 2.05 | 2.01 | 1.96 | 1.91 |
| | 24 | 4.26 | 3.40 | 3.01 | 2.78 | 2.62 | 2.51 | 2.42 | 2.36 | 2.30 | 2.25 | 2.18 | 2.11 | 2.03 | 1.98 | 1.94 | 1.89 |
| | 25 | 4.24 | 3.39 | 2.99 | 2.76 | 2.60 | 2.49 | 2.40 | 2.34 | 2.28 | 2.24 | 2.16 | 2.09 | 2.01 | 1.96 | 1.92 | 1.87 |
| 30 | 4.17 | 3.32 | 2.92 | 2.69 | 2.53 | 2.42 | 2.33 | 2.27 | 2.21 | 2.16 | 2.09 | 2.01 | 1.93 | 1.89 | 1.84 | 1.79 | |
| 40 | 4.08 | 3.23 | 2.84 | 2.61 | 2.45 | 2.34 | 2.25 | 2.18 | 2.12 | 2.08 | 2.00 | 1.92 | 1.84 | 1.79 | 1.74 | 1.69 | |
| 60 | 4.00 | 3.15 | 2.76 | 2.53 | 2.37 | 2.25 | 2.17 | 2.10 | 2.04 | 1.99 | 1.92 | 1.84 | 1.75 | 1.70 | 1.65 | 1.59 | |
| 120 | 3.92 | 3.07 | 2.68 | 2.45 | 2.29 | 2.18 | 2.09 | 2.02 | 1.96 | 1.91 | 1.83 | 1.75 | 1.66 | 1.61 | 1.55 | 1.50 | |
| ∞ | 3.84 | 3.00 | 2.60 | 2.37 | 2.21 | 2.10 | 2.01 | 1.94 | 1.88 | 1.83 | 1.75 | 1.67 | 1.57 | 1.52 | 1.46 | 1.39 | |

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| 考試科目 | 統計學 | 系所別 | 經濟學系三年級 | 考試時間 | 7月5日(三) 第四節 |
|------|-----|-----|---------|------|-------------|

B.7 Critical Values of Chi-Square

This table contains the values of χ^2 that correspond to a specific right-tail area and specific number of degrees of freedom.



Example: With 17 df and a .02 area in the upper tail, $\chi^2 = 30.995$

| Degrees of Freedom, df | Right-Tail Area | | | |
|--------------------------|-----------------|--------|--------|--------|
| | 0.10 | 0.05 | 0.02 | 0.01 |
| 1 | 2.706 | 3.841 | 5.412 | 6.635 |
| 2 | 4.605 | 5.991 | 7.824 | 9.210 |
| 3 | 6.251 | 7.815 | 9.837 | 11.345 |
| 4 | 7.779 | 9.488 | 11.668 | 13.277 |
| 5 | 9.236 | 11.070 | 13.388 | 15.086 |
| 6 | 10.645 | 12.592 | 15.033 | 16.812 |
| 7 | 12.017 | 14.067 | 16.622 | 18.475 |
| 8 | 13.362 | 15.507 | 18.168 | 20.090 |
| 9 | 14.684 | 16.919 | 19.679 | 21.666 |
| 10 | 15.987 | 18.307 | 21.161 | 23.209 |
| 11 | 17.275 | 19.675 | 22.618 | 24.725 |
| 12 | 18.549 | 21.026 | 24.054 | 26.217 |
| 13 | 19.812 | 22.362 | 25.472 | 27.688 |
| 14 | 21.064 | 23.685 | 26.873 | 29.141 |
| 15 | 22.307 | 24.996 | 28.259 | 30.578 |
| 16 | 23.542 | 26.296 | 29.633 | 32.000 |
| 17 | 24.769 | 27.587 | 30.995 | 33.409 |
| 18 | 25.989 | 28.869 | 32.346 | 34.805 |
| 19 | 27.204 | 30.144 | 33.687 | 36.191 |
| 20 | 28.412 | 31.410 | 35.020 | 37.566 |
| 21 | 29.615 | 32.671 | 36.343 | 38.932 |
| 22 | 30.813 | 33.924 | 37.659 | 40.289 |
| 23 | 32.007 | 35.172 | 38.968 | 41.638 |
| 24 | 33.196 | 36.415 | 40.270 | 42.980 |
| 25 | 34.382 | 37.652 | 41.566 | 44.314 |
| 26 | 35.563 | 38.885 | 42.856 | 45.642 |
| 27 | 36.741 | 40.113 | 44.140 | 46.963 |
| 28 | 37.916 | 41.337 | 45.419 | 48.278 |
| 29 | 39.087 | 42.557 | 46.693 | 49.588 |
| 30 | 40.256 | 43.773 | 47.962 | 50.892 |

備

註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

| | | | | | |
|------|-----|-----|----------------------|------|------------|
| 考試科目 | 微積分 | 系所別 | 資訊管理學系二年級 經濟學系二年級 | 考試時間 | 7月5日(三)第四節 |
|------|-----|-----|----------------------|------|------------|

A.

Problem 1 Prove or disprove the following statements:

- (8%) If $a_k > 0$ for all $k \in \mathbb{N}$ and $\lim_{n \rightarrow \infty} a_n = 0$, then the series $\sum_{n=1}^{\infty} (-1)^{n+1} a_n$ is convergent.
- (8%) The series $\sum_{n=1}^{\infty} \ln\left(\frac{n^2}{n^2+1}\right)$ is convergent.
- (8%) Let $f(x, y) = \frac{xy \sin y}{3x^2 + y^2}$ if $(x, y) \neq (0, 0)$ and $f(x, y) = 0$ if $(x, y) = (0, 0)$. Then f is continuous at $(0, 0)$.

Problem 2 (8%) Evaluate the following integral

$$\int_0^1 \left(\int_{\sqrt{y}}^1 e^{x^3} dx \right) dy.$$

Problem 3 (8%) Find the extreme value of $f(x, y) = x^2 + y^2 - 3x - xy$ subject to $x^2 + y^2 \leq 9$

Problem 4 (10%) Find the Maclaurin series of $f(x) = \frac{1}{\sqrt[4]{16-x}}$ and the associated radius of convergence.

備註

- 作答於試題上者，不予計分。
- 試題請隨卷繳交。

| | | | | | |
|------|-----|-----|----------------------|------|------------|
| 考試科目 | 微積分 | 系所別 | 資訊管理學系二年級 經濟學系二年級 | 考試時間 | 7月5日(三)第四節 |
|------|-----|-----|----------------------|------|------------|

B.

1. (24pt) Short questions, you just need to give the final answer in each part.

(此大題請直接填寫答案，不需要提供過程說明)

a. (3pt) $\lim_{x \rightarrow \infty} \left(1 + \frac{2}{x}\right)^{5x}$

b. (3pt) $f(x) = x \ln(x)$, $x > 0$. Find minimum value of $f(x)$

c. (3pt) $f(x)$ is differentiable and $xf(x) + f(x^2) = 2$ for $x > 0$. Find $f'(1)$

d. (3pt) Find $\lim_{x \rightarrow \infty} \left(\frac{x^2 + 1}{x+2}\right)^{1/x}$

e. (6pt) $f(x) = \frac{x+x \cos(x)}{\sin(x) \cos(x)}$. Find $\lim_{x \rightarrow 0} f(x)$

f. (6pt) $f(x) = \frac{x+\sin(x)+2\sqrt{x}}{x+\sin(x)}$. Find $\lim_{x \rightarrow \infty} f(x)$

以下兩題請提供過程說明

2. (14pt) Let $f(x)$ be a positive function for $x \geq 0$ and $M(t) = \int_0^{\infty} e^{tx} f(x) dx$. Suppose that the interchange of the differentiation and integration is valid, and $M(0) = 1$, $M'(0) = 0$, $M''(0) = 1$.

Show that $\lim_{n \rightarrow \infty} \left\{M\left(\frac{t}{\sqrt{n}}\right)\right\}^n = e^{t^2/2}$.

3. (12pt) Let $S(a, b) = \sum_i (y_i - a - bx_i)^2$, where $\sum_i x_i^2 = n$, $\sum_i x_i = n/2$.

(a) (6pt) Let (a_1, b_1) be the minimizer of $S(a, b)$. Find (a_1, b_1)

(b) (6pt) Under the constraint $a+b=c$, find the minimizer of $S(a, b)$ in terms of (a_1, b_1) and c .

Ps., y_i is a known number for $i=1, 2, \dots, n$.

備註

- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。