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1. (20 分) 若  $f(x) = e^{5x}$

請計算下列微分:

甲、 $f'(1)$

乙、 $f''(0)$

2. (20 分) 若  $g(t) = \sin(t) \cos(t)$

請計算下列微分

甲、 $g'(0)$

乙、 $g''(0)$

3. (30 分) 若  $i^2 = -1, w = e^{2\pi i/5}$ ,

請計算下列級數合

甲、 $\sum_{k=0}^4 w^k$

乙、 $\sum_{k=0}^4 w^{2k}$

丙、 $\sum_{k=0}^4 w^{3k}$

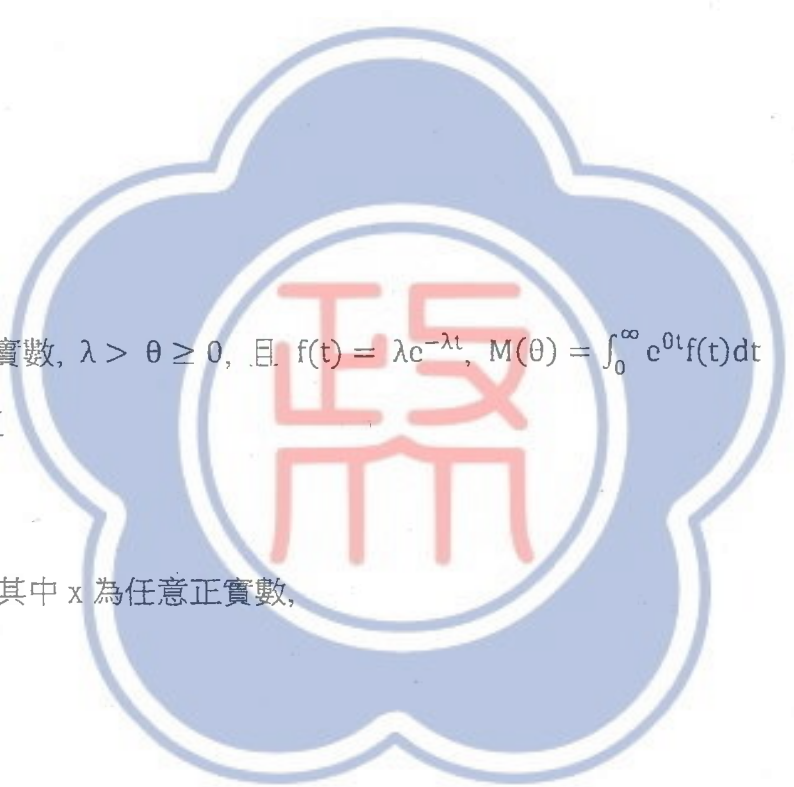
4. (30 分) 若  $\lambda, \theta$  為實數,  $\lambda > \theta \geq 0$ , 且  $f(t) = \lambda e^{-\lambda t}$ ,  $M(\theta) = \int_0^{\infty} e^{\theta t} f(t) dt$

請計算下列函數的值

甲、 $M(0)$

乙、 $M'(\theta)$

丙、 $\int_x^{\infty} f(t) dt$ , 其中  $x$  為任意正實數,



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**第一題 (40分):**

諾貝爾的生理及醫學獎是獎勵得獎人對基礎生理及醫學領域的發現 (discovery) 及對人類有巨大的益處 (greatest benefit on mankind)。1962年諾貝爾的生理及醫學獎發給了 James Watson, Francis Crick 及 Maurice Wilkin 因為他們發現了 DNA 的結構及性質。1978年 Werner Arber, Daniel Nathans 及 Hamilton Smith 得到了諾貝爾的生理及醫學獎因為他們發現了“限制酵素” 其及應用方法 (for the discovery of restriction enzymes and their application to problems of molecular genetics)。其後 Stanley Cohen 與 Herbert Boyer 以 “Process for producing biologically functional molecular chimeras” 申請專利而在 1980年獲得了專利。在專中他們描述了一個很重要的過程, 這個過程叫做 “gene splicing”。

請解釋什麼叫 Gene Splicing, 並解釋為什麼 Gene Splicing 是生技工程最重要的發明。

**第二題 (30分)**

台灣的科研實力一流, 台灣生技科學家經常能發表高水準的論文, 刊在頂尖的學術期刊, 但卻在全球每年數千億美元的製藥與醫材市場上鮮少斬獲, 凸顯出研發成果與產業加值的斷層。經過數十年的政府大量投資生技製藥的研發, 但如何往前卻莫衷一是, 有些人認為台灣應發展適合台灣市場的新藥, 但批評的人認為發展新藥費用嚇人, 失敗率高, 台灣市場太小, 倒不如幫助我們已有的國內學名藥廠, 增加他們在國內外的競爭力。

面對這樣的困境, 請您回答下面的問題:

1. 您認為我們的政府應該如何因應呢?
2. 假如您是一個科研工作者, 您應該如何因應呢?
3. 假如您是一個業者, 您應該如何因應呢?

**第三題 (30分)**

根據 iThome 的調查, 2001年企業網路投資的目標趨勢約五成要改善網路架構, 三成多要改善流量管理, 二成多要擴大內網頻寬。而在應用方面, 資訊安全卻是企業最大的憂慮, 防毒防駭, 郵件安全, 上網行為管理, 資料庫安全及文件控管是五大最優先項目。防毒防駭等外來的威脅可以理解, 但改善內部人員的上網行為、加強內網應用、再加上資訊安全管理及控管, 卻是有點費解。

假如您是企業員工, 您認為有管理及控管 “您” 的必要嗎 [並請解釋您的論點及理由]?

[共三題, 完]

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**Multiple Choice (1.7 points each)** 選擇題請在答案卡上作答，否則不予計分。

Identify the letter of the choice that best completes the statement or answers the question.

Mark each answer clearly with a No. 2 pencil on the Scantron form.

1. When a firm is operating at efficient scale, average total cost will
  - (a) fall as output is increased.
  - (b) fall as output is decreased.
  - (c) be at its maximum.
  - (d) none of the above.
  
2. If marginal cost exceeds marginal revenue, then
  - (a) the firm must be experiencing losses.
  - (b) the firm may still be earning a profit.
  - (c) the firm is most likely to be at a profit maximizing level of output.
  - (d) a profit maximizing firm should increase the level of production.
  
3. When a competitive market that is comprised of firms that have identical cost structures experiences a sudden yet persistent increase in demand, which of the following are most likely to happen?
  - (i) New firms will enter the market.
  - (ii) In the long-run all firms will be producing at their efficient scale.
  - (iii) The price will return to the level before the changes in demand in the long-run.
  - (a) (i) and (ii) only
  - (b) (i) and (iii) only
  - (c) (ii) and (iii) only
  - (d) (i), (ii) and (iii)
  
4. Excessive monopoly profits themselves represent
  - (a) a deadweight loss.
  - (b) a shrinkage in total surplus.
  - (c) a shrinkage in consumer surplus.
  - (d) all of the above.
  
5. Since natural monopolies have a declining average cost curve, regulating a natural monopoly by setting price equal to marginal cost would

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- (a) cause the monopolist to operate at a loss.  
 (b) maximize producer surplus.  
 (c) result in a less than optimal total surplus.  
 (d) achieve the optimal output level as in the competitive market in the long-run.
6. Consider the Chamberlin's monopolistic competition model. In the short-run equilibrium, the price of a firm must
- (a) equal to the marginal cost  
 (b) equal to the marginal cost times the markup and be smaller than the average cost.  
 (c) equal to the marginal cost times the markup and be greater or equal to the average cost.  
 (d) be smaller than the marginal cost.
7. Suppose there are only two firms supplying in the market and they produce a homogeneous good. Two firms produce the good with the same constant marginal cost. There is no other cost of production. Firms compete by setting price simultaneously. Consumers maximize their utilities. The equilibrium price of both firms must
- (a) equal to the marginal cost times the markup.  
 (b) equal to the marginal cost  
 (c) be greater than the marginal cost but smaller than the marginal cost times the markup.  
 (d) equal to the average cost.
8. Everything is the same as previous question, but one firm (firm A) has higher marginal cost than the other (firm B.) The equilibrium price must
- (a) equal to the marginal cost of firm A  
 (b) equal to the marginal cost of firm B  
 (c) be slightly below the marginal cost of firm A or equal to the optimal price of firm B as it has the monopoly power.  
 (d) equal to the average cost of firm A.
9. Suppose in a country, there is a sector where producers produce a homogeneous good with an increasing constant marginal cost. There is a negative externality when producing the good. Suppose the country is a small open economy, which means it can import the good with a constant price. Suppose also that it does not have comparative advantage in producing the good and there is no complete specialization under free trade. In the following choices, what is the best policy to resolve the problem of externality?
- (a) Using an import subsidy.  
 (b) Using a production subsidy.  
 (c) Using a tariff.  
 (d) Using a production tax.

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10. In a Ricardian trade model with two countries and two goods, suppose one country has absolute advantage in producing both goods. Goods are traded freely. The country with lower productivity must produce at least one good because
- both countries enjoy gains from trade.
  - otherwise, the factor market cannot be clear.
  - two countries complete specialize in a sector at equilibrium.
  - both goods are demanded.
11. A simple linear demand function may be stated as  $Q = a - bP + cI$  where  $Q$  is quantity demanded,  $P$  is the product price, and  $I$  is consumer income. To compute an appropriate value for  $c$ , we can use observed values for  $Q$  and  $I$  and then set the estimated income elasticity of demand equal to:
- $c(I/Q)$
  - $c(Q/I)$
  - $-b(I/Q)$
  - $Q/(cI)$
12. Use the following two statements to answer this question:
- If utility is ordinal, a market basket that provides 30 utils provides twice the satisfaction of a market basket that provides 15 utils.
  - When economists first studied utility it was believed that utility was cardinal, but it was later discovered that ordinal preferences are sufficient to explain how most individual decisions are made.
- Both I and II are true.
  - I is true, and II is false.
  - I is false, and II is true.
  - Both I and II are false.
13. Which of the following demand functions represents a price elasticity of demand equal to  $-0.33$  and an income elasticity of demand equal to  $0.8$  at all points along the curve?
- $Q = 3 - 0.33P + 0.8I$
  - $Q = 4.5 - 0.33\log(P) + 0.8I$
  - $\log(Q) = 1.34 - 0.33\log(P) + 0.8I$
  - $\log(Q) = 2.34 - 0.33 \log(P) + 0.8 \log(I)$
14. Bob views apples and oranges as perfect substitutes in his consumption, and  $MRS = 1$  for all combinations of the two goods in his indifference map. Suppose the price of apples is \$2 per pound, the price of oranges is \$3 per pound, and Bob's budget is \$30 per week. What is Bob's utility maximizing choice between these two

請注意：背面還有試題。

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goods?

- (a) 4 pounds of apples and 6 pounds of oranges
- (b) 5 pounds of apples and 5 pounds of oranges
- (c) 10 pounds of oranges and no apples
- (d) 15 pounds of apples and no oranges

15. Assume that we have a demand curve of the form:

$$\log(Q) = a - b \log(P) + c \log(I),$$

where  $Q$  = quantity,  $P$  = price,  $I$  = income, and  $a$ ,  $b$ , and  $c$  are positive constants. The income and price elasticities for the demand curve represented above are always

- (a) equal to one.
- (b) equal to zero.
- (c) equal (i.e., income elasticity always equals price elasticity).
- (d) constant but not necessarily equal to one another.

16. Let  $P$  denote the price of goods in the Taiwan,  $P^W$  denote the price of goods in the foreign country, and  $E$  the exchange rate, measured as the number of units of foreign currency that can be purchased with one NTD.

According to the law of one price,

- (a)  $P = EP^W$ .
- (b)  $P^W = EP$ .
- (c)  $E = P/P^W$ .
- (d)  $P^W = E + P$ .

17. Purchasing-power parity describes the forces that determine

- (a) prices in the short run.
- (b) prices in the long run.
- (c) exchange rates in the short run.
- (d) exchange rates in the long run.

18. If a McDonald's Big Mac cost \$3.06 in the United States and 3.21 euros in the Euro area, then purchasing-power parity implies the nominal exchange rate is how many euros per dollar (approximately)?

- (a) 1.05. If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
- (b) 1.05. If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.
- (c) .95. If the value is less than this, it costs more dollars to buy a Big Mac in the U.S. than in the Euro area.
- (d) .95. If the value is less than this, it costs fewer dollars to buy a Big Mac in the U.S. than in the Euro area.

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<p>19. Which of the following does the level of real GDP measure?</p> <p>(a) total real income  (b) productivity  (c) the standard of living  (d) All of the above are correct.</p> <p>20. "When workers have a relatively small quantity of capital to use in producing goods and services, giving them an additional unit of capital increases their productivity by a relatively large amount." This statement</p> <p>(a) is an assertion that production functions have the property of constant returns to scale.  (b) is consistent with the view that capital is subject to diminishing returns.  (c) is inconsistent with the view that it is easier for a country to grow fast if it starts out relatively poor.  (d) All of the above are correct.</p> <p>21. If an unemployed person quits looking for work, then, other things the same, the unemployment rate</p> <p>(a) decreases and the labor-force participation rate is unaffected.  (b) and the labor-force participation rate both decrease.  (c) is unaffected and the labor-force participation rate decreases.  (d) and the labor-force participation rate are both unaffected.</p> <p>22. Suppose that efficiency wages become more common in the economy. Economists would predict that this would</p> <p>(a) increase the quantity demanded and decrease the quantity supplied of labor, thereby decreasing the natural rate of unemployment.  (b) decrease the quantity demanded and increase the quantity supplied of labor, thereby increasing the natural rate of unemployment.  (c) increase the quantity demanded and decrease the quantity supplied of labor, thereby increasing the natural rate of unemployment.  (d) decrease the quantity demanded and increase the quantity supplied of labor, thereby decreasing the natural rate of unemployment.</p> <p>23. An increase in the money supply</p> <p>(a) and an investment tax credit both cause aggregate demand to shift right.  (b) and an investment tax credit both cause aggregate demand to shift left.  (c) causes aggregate demand to shift right, while an investment tax credit causes aggregate demand to shift left.</p>					

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(d) causes aggregate demand to shift left, while an investment tax credit causes aggregate demand to shift right.

24. Sticky nominal wages can result in

- (a) lower profits for firms when the price level is lower than expected.
- (b) a decrease in real wages when the price level is lower than expected.
- (c) a short-run aggregate-supply curve that is vertical.
- (d) a long-run aggregate-supply curve that is upward-sloping.

25. Which of the following would cause prices and real GDP to rise in the short run?

- (a) an increase in the expected price level
- (b) an increase in the money supply
- (c) a decrease in the capital stock
- (d) None of the above is correct.

26. Which of the following monetary policy violates Taylor principle?

- (a) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 2.5%.
- (b) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 3%.
- (c) The central bank raises the federal funds rate from 1% to 2% when inflation goes from 2% to 3%.
- (d) The central bank raises the federal funds rate from 1% to 2% when output gap goes from 2% to 2.5%.

27. The M1 money multiplier will shrink due to

- (a) smaller excess reserves ratio.
- (b) smaller currency ratio.
- (c) greater time deposits ratio.
- (d) greater required reserves ratio.

28. A higher growth rate of money supply causes

- (a) lower interest rates if liquidity effect is larger than income and expected inflation effects.
- (b) higher interest rates if liquidity effect is larger than income and expected inflation effects.
- (c) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is slow.
- (d) lower interest rates if liquidity effect is smaller than income and expected inflation effects and the adjustment of expected inflation is fast.

29. Nowadays, most countries do not adopt monetary targeting since

- (a) the public do not understand how monetary targeting works.
- (b) the velocity of money is unstable and quite volatile.

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- (c) the relationship of output and money aggregates is weak.
- (d) inflation and money aggregates have inverse relationship.

30. Which of the following statements is true?

- (a) The conventional Phillips curve has microeconomic foundation.
- (b) The New Keynesian Phillips curve is merely a statistical relation.
- (c) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and unemployment.
- (d) The New Keynesian Phillips curve describes how current inflation depends on future expected inflation and real marginal cost.

**Numerical/algebraic problems and short-essay questions**

Please answer the following questions IN SEQUENCE. All questions may be answered in EITHER Chinese OR English.

1. A video game producer has costs of \$25,000 per month that are fixed with regard to output. The firm has a flat marginal cost at \$5 per unit of output for output between 1 and 16,000 units. The firm **cannot** produce more than 16,000 units. Information from the market research group indicates that the demand for the video game can be represented by the following  $P = 9.8 - 0.0002Q$ .

(a) (3 points) What price should be set to maximize profit? How many units of the game are sold? What are the profits of the firm?

The firm has the opportunity to sell in a second market that is separated from the first. For the second market the market research group has estimated the demand relationship to be  $P_2 = 7 - 0.0001Q_2$ .

(b) (5 points) The firm believes that this second market offers an opportunity for additional profit. Should it sell only units that would not be absorbed in the primary market at the profit-maximizing price or should it divert some units from the primary to the secondary market? What price would you set in each market? What is the profit of the firm?

2. Suppose there is a country producing two goods with the following technology

$$Q_x = L_x$$

$$Q_y = K_y$$

Suppose that the labor supply is fixed at 50 units and the capital supply is fixed at 100 units. Consumers spend

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half of their income on good X and the rest of income on good Y. All markets are perfectly competitive. Let good Y be the numeraire. Answer the following questions

- (a) (3 points) Derive the equilibrium price of X relative to Y.
- (b) (3 points) Suppose there is another country producing two goods with the same technology and consumers in that country also evenly spend their income on both goods. In this country, the supply of labor is fixed at 100 units and the supply of capital is fixed at 50 units. Derive the equilibrium price of X relative to Y if two countries trade freely.
- (c) (3 points) What is the good the capital abundant country exports? How many quantities of that good does it export?

3. Chester lives in a dormitory that offers soft drinks and chips for sale in vending machines. His utility function is  $U = 3SC$  (where S is the number of soft drinks per week and C the number of bags of chips per week), so his marginal utility of S is  $3C$  and his marginal utility of C is  $3S$ . Soft drinks are priced at \$0.50 each, chips \$0.25 per bag.

- (a) (3 points) Write an expression for Chester's marginal rate of substitution between soft drinks and chips.
- (b) (3 points) Use the expression generated in part (a) to determine Chester's optimal mix of soft drinks and chips.
- (c) (2 points) If Chester has \$5.00 per week to spend on chips and soft drinks, how many of each should he purchase per week?

4. To catch up with the living standard of the US,

- (a) (4 points) Can a sufficiently poorer country achieve this goal by simply receiving more capital donated by the United Nation on a per-capita basis? Why or why not?
- (b) (4 points) Can a sufficiently poorer country achieve this goal by simply increase her saving rate? Why or why not?

5. Use the model of aggregate demand and aggregate supply to illustrate each of the following event's short-run and long-run impacts on the aggregate price level and aggregate output.

- (a) (4 points) There is an increase in households' wealth due a stock market boom.
- (b) (4 points) The government lowers taxes, leaving households with more disposable income, with no corresponding reduction in government spending.

6. Consider a model that the central bank may have incentives to deviate from a monetary policy rule. The central bank's objective is to maximize the expected value of

$$U = \lambda(y - y_n) - \frac{1}{2}\pi^2,$$

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where  $y$  is output,  $y_n$  is the economy's natural rate of output,  $\pi$  is inflation rate, and  $\lambda > 0$ . The aggregate output is given by a Lucas-type supply function:

$$y = y_n + a(\pi - \pi^e) + e,$$

where  $\pi^e$  is expected inflation,  $e$  is a supply shock ( $e \sim N(0, \sigma_e^2)$ ), and  $a > 0$ . The link between inflation and the monetary policy instrument is given by

$$\pi = \Delta m + v,$$

where  $\Delta m$  is the growth rate of money and  $v$  is a velocity disturbance ( $v \sim N(0, \sigma_v^2)$ ). We assume that the central bank can observe  $\pi^e$  and the realization of  $e$  but not the realization of  $v$  before its choice of  $\Delta m$ . We also assume that two disturbances  $e$  and  $v$  are uncorrelated.

- (a) (4 points) What is the central bank's optimal choice of  $\Delta m$ ?
- (b) (4 points) Compared to the case that the central bank commits to a rule  $\Delta m = 0$ , which policy makes the society better off (i.e. higher expected utility)? Show all your work.

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- 一、 近來許多有精神障礙者被拐騙當公司負責人或向銀行、地下錢莊借款的人頭，家屬有何方法可以避免精障者日後遭國稅局或債權人向法院訴請應負民事法律責任之不利益？(25%)
- 二、 小明於民國100年元月2日和房東朱小姐簽訂一年期的小套房租賃契約，每月租金新台幣（以下同）壹萬元、押金貳萬元，請問：
- （一）小明入住後發現套房內的水管不通和燈泡燒壞，打電話給房東請朱小姐處理，但朱小姐都說有空時再處理，因農曆年快到小明急於修繕水管和燈泡，是否有方法可以解決問題不用癡癡的等房東？(10%)
- （二）小明農曆年後被解雇，沒薪水可以交房租，每次朱小姐催繳房租時，小明都說找到工作再付，朱小姐自認倒楣遇到租屋蟑螂，希望趕快收回出租房屋，朱小姐是否有救濟的方法？(15%)
- 三、 大柱、二柱和三柱三兄弟繼承母親遺留一筆中正區精華地段土地，因房地產飆漲F財團欲收購該筆土地建豪宅出售，大柱、二柱希望將土地賣給F財團賺錢，但三柱堅決不同意，而在土地上搭農舍、種菜，請問F財團應如何處理才能順利合法收購、取得清空的土地？(25%)
- 四、 阿花和男友阿星（均成年）分手後發現已懷孕，但阿花找阿星對她們母子負責時，阿星都避不見面，等小孩出生後，阿星仍置之不理，因阿花是未婚媽媽在早餐店打工，賺的薪水不夠養小孩，請問阿花應如何依法主張阿星應對小孩負扶養責任？(25%)