

考試科目	微積分 41912	系所別	科管智財所 (科管組)	考試時間	2月18日(六)第一節
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注意事項:

- 一、每題皆請詳列計算過程，無計算過程僅寫答案者不予計分。
- 二、請勿使用任何形式之計算機或計算器

題目：

1. Please find the line tangent to the curve $y^2 - 4x^2 + 8y + 20 = 0$ at the point (3, 2). (10%)
2. Please find the line normal to the curve $y^2 - 4x^2 + 8y + 10 = 0$ at the point (4, 4). (10%)
3. Please solve the differential equation $\frac{dy}{dx} = 3x^2\sqrt{y}$, $y > 0$. (10%)
4. Please solve the equation $e^{3y} = 3 + \sin x$. (10%)
5. Please find $\frac{d}{dx} \sin^{-1} y$, if $y = x^2$. (10%)
6. Please find $\int_{\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x \sqrt{1 + \sin x} dx$. (10%)
7. Please solve the equation $\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = 0$. (20%)
8. Please find the following integral and draw the area $\int_0^{\pi} \int_0^x 2x \sin y dy dx$. (20%)

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- 一、作答於試題上者，不予計分。
- 二、試題請隨卷繳交。

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Multiple Choice (1 point each)

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

- Mike and Sandy are two woodworkers who both make tables and chairs. In one month, Mike can make 4 tables or 20 chairs, while Sandy can make 6 tables or 18 chairs. Given this, we know that
 - Mike has an absolute advantage in chairs.
 - Mike has a comparative advantage in tables.
 - Sandy has an absolute advantage in chairs.
 - Sandy has a comparative advantage in chairs.
- New oak tables are normal goods. What would happen to the equilibrium price and quantity in the market for oak tables if the price of maple tables rises and the price of wood saws increased?
 - Price will fall and the effect on quantity is ambiguous.
 - Price will rise and the effect on quantity is ambiguous.
 - Quantity will fall and the effect on price is ambiguous.
 - Quantity will rise and the effect on price is ambiguous.
- When a good is taxed, the burden of the tax
 - falls more heavily on the side of the market that is more elastic.
 - falls more heavily on the side of the market that is more inelastic.
 - falls more heavily on the side of the market that is closer to unit elastic.
 - is distributed independently of relative elasticities of supply and demand.
- An optimal tax on pollution would result in which of the following?
 - Producers will choose not to produce any pollution.
 - Producers will internalize the cost of pollution.
 - Producers will maximize production.
 - The value to consumers at market equilibrium will exceed the social cost of production.
- Which of the following is not a characteristic of pollution permits?
 - Prices are set by supply and demand.
 - Allowing firms to trade their permits reduces the total quantity of pollution beyond the initial allocation.
 - Real-world markets for pollution permits include sulfur dioxide and carbon.

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- D. Firms for whom pollution reduction is very expensive are willing to pay more for permits than firms for whom pollution reduction is less expensive.
6. The marginal product of labor is equal to the
- increase in labor necessary to generate a one unit increase in output.
 - increase in output obtained from a one unit increase in labor.
 - incremental profit associated with a one unit increase in labor.
 - incremental cost associated with a one unit increase in labor.
7. When marginal revenue equals marginal cost,
- the firm must be generating economic profits.
 - the profit maximizing firm should always increase its level of production.
 - the firm must be generating economic losses.
 - losses are minimized even if the firm is not making a profit.
8. Which of the following statements is true of monopolies?
- Monopolies can charge any price they want.
 - Unlike competitive firms, monopolies are not constrained by market demand.
 - Monopolies will always increase their revenue by selling more of their goods.
 - All of the above are correct.
9. Because each oligopolist cares about its own profit rather than the collective profit of all the oligopolists together,
- society is worse off.
 - they are able to maximize their individual profits.
 - they are unable to maintain monopoly power.
 - All of the above are correct.
10. If firms in a monopolistically competitive market are earning economic profits, which of the following scenarios would best reflect the change facing incumbent firms as the market adjusts to its new equilibrium?
- a downward shift in their marginal cost curve
 - an upward shift in their marginal cost curve
 - an increase in demand
 - a decrease in demand

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11. The menu cost of inflation arises since
- people hold less currency if inflation is positive and thus they take more trips to the bank.
 - the central bank eventually has to restrict money supply and this causes an increase in the unemployment rate.
 - real wages and real money holdings lose purchasing power.
 - resources have to be devoted to marking up prices and changing vending machines and cash registers.
12. In the medium run, if government purchases are increased and nominal money supply is decreased, we can expect that
- aggregate demand and prices will increase but interest rates will not change.
 - aggregate demand, prices, and the interest rate will all decrease.
 - aggregate demand and interest rates will decrease but prices will increase.
 - the interest rate will increase while aggregate demand and prices may increase, decrease, or remain the same.
13. Assume you would like to stimulate investment but leave the level of GDP roughly the same. What policy mix would you propose?
- an income tax cut combined with monetary expansion
 - a tax cut combined with monetary restriction
 - a cut in government spending combined with monetary expansion
 - a cut in government spending combined with monetary restriction
14. Given a normal IS-LM model, which of the following is FALSE?
- Expansionary monetary policy will increase the level of investment and consumption.
 - Lower income taxes will raise the level of consumption but lower the level of investment.
 - A cut in government transfer payments will reduce consumption and interest rates.
 - An investment subsidy will increase the level of investment but not the level of consumption.
15. If we compare a closed economy to an open economy under a flexible exchange rate system, we can see that fiscal policy is always
- more effective because of positive repercussion effects.
 - more effective because the marginal propensity to import is positive.
 - less effective because part of the increase in domestic income is spent on foreign goods.

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D. less effective because expansionary fiscal policy always has to be supplemented by restrictive monetary policy.

16. If the government increases expenditures on goods and services and increases taxation by the same amount, which of the following will occur?

- A. Aggregate demand will be unchanged.
- B. Aggregate demand will increase.
- C. The money supply will decrease.
- D. The money supply will increase.

17. To counteract a recession, the central bank should

- A. sell securities on the open market and raise the discount rate.
- B. sell securities on the open market and lower the discount rate.
- C. buy securities on the open market and raise the discount rate.
- D. buy securities on the open market and lower the discount rate.

18. If the reserve requirement is 25 percent and banks hold no excess reserves, an open market sale of \$400,000 of government securities by the central bank will

- A. increase the money supply by up to \$1.6 million.
- B. decrease the money supply by up to \$1.6 million.
- C. increase the money supply by up to \$400,000.
- D. decrease the money supply by up to \$400,000.

19. If nominal gross domestic product fell while real gross domestic product rose, which of the following must be true?

- A. Unemployment increased.
- B. The inflation rate was negative.
- C. Net exports were negative.
- D. The average of stock prices rose while bond prices fell.

20. The purchase of bonds by the central bank will have the greatest effect on real gross domestic product if which of the following situations exists in the economy?

- A. The required reserve ratio is high, and the interest rate has a large effect on investment spending.

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- B. The required reserve ratio is high, and the interest rate has a small effect on investment spending.
- C. The required reserve ratio is low, and the interest rate has a large effect on investment spending.
- D. The required reserve ratio is low, and the marginal propensity to consume is low.

Problems and Short-essay Questions

Please answer the following questions IN SEQUENCE. All questions may be answered in either Chinese or English.

1. Consider an individual who has I dollars to allocate between good x and good y and whose preference is represented by the quasi-linear utility function $U(x, y) = \ln x + y$. Let p_x and p_y denote, respectively, the prices of good x and good y .
- A. (6 points) Calculate the Marshallian demand functions for good x and good y .
- B. (6 points) Suppose that $p_x = 1$, $p_y = 2$, and $I = 8$. Calculate the income elasticity of demand for each good.
- C. (4 points) Now suppose the government levies a 1 dollar per unit tax on good x such that the price of good x increases to $p_x = 2$ while the price of good y and income remain unchanged at $p_y = 2$ and $I = 8$. Calculate the tax revenue and the indirect utility.
- D. (4 points) Suppose instead of taxing the consumption of good x , an income tax that collects the same amount of tax revenue as in part (C) is imposed. Calculate the indirect utility.

2. In a monopolistically competitive market, a firm faces the following demand function:

$$q = \frac{P^{-\sigma}}{N},$$

where q is the quantity demanded, P is the price, $\sigma > 1$ is a constant, N is the number of producers. The total cost of production is $f + cq$, where f and c are both positive and constants.

- A. (10 points) Derive the optimal price charged by the firm.
- B. (10 points) Calculate the number of producers at equilibrium.

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3. Consider an economy in which production is characterized by the neoclassical function $Y = K^{0.5}N^{0.5}$, where Y , K and N denote the output, capital stock and quantity of labor, respectively. Suppose that it has a saving rate of 0.1, a population growth rate of 0.02, and an average depreciation rate of 0.03.

A. (5 points) Write this production function in per capita form in which $y = Y/N$ and $k = K/N$, and find the steady-state value of y and k .

B. (5 points) At the steady-state value of k , is there more or less capital than at the golden-rule level?

C. (5 points) Determine what saving rate would yield the golden-rule level of capital in this model.

D. (5 points) In the context of this neoclassical growth model, can a country have *too much* saving?

4. Answer the following two questions:

A. With a consumption function $C = 100 + 0.8Y_d$ (Y_d , the disposable income, is defined as income after taxes: $Y_d = Y - T$), investment $I = 200$, government expenditure $G = 100$, transfer payment $TR = 62.5$, tax revenue $T = 0.25Y$, compute

- (4 points) the equilibrium national income;
- (4 points) the balanced budget multiplier for this economy.

B. For a country with the following macroeconomic statistics: national income=5000; disposable income=4000; government budget deficit=200; consumption=3500; and trade deficit=100, compute levels of

- (4 points) saving;
- (4 points) investment;
- (4 points) government expenditure for this country.

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