

東吳大學 103 學年度轉學生(含進修學士班轉學生)招生考試試題

第 1 頁, 共 2 頁

系級	經濟學系三年級	考試時間	100 分鐘
科目	微積分	本科總分	100 分

1. (10 points) Find the stationary values of the following, and check whether they are relative maxima or minima or inflection points, assuming the domain to be the interval $[0, \infty)$:

(a) $y = x^3 - 3x + 5$.

(b) $y = \frac{1}{3}x^3 - x^2 + x + 10$.

2. (10 points) Find the extreme value(s) of $z = 2x_1^2 + x_1x_2 + 4x_2^2 + x_1x_3 + x_3^2 + 2$.

3. (10 points) Suppose that the demand and supply functions for a good are

$$D = 30 - 2p - y, \quad S = p$$

Find the effect of a change in income (y) on equilibrium price and quantity.

4. (10 points) Are the following functions strictly monotonic?

(a) $y = -x^6 + 5 \quad (x > 0)$

(b) $y = 4x^5 + x^3 + 3x$

Find dx/dy by the inverse-function rule.

5. (20 points) Let the demand and supply functions for a commodity be:

$$Q_d = D(P, Y_0) \quad (D_P < 0; D_{Y_0} > 0)$$

$$Q_s = S(P, T_0) \quad (S_P > 0; S_{T_0} < 0)$$

where Y_0 is income and T_0 is the tax on the commodity. All derivatives are continuous.

(a) Write the equilibrium condition in a single equation.

(b) Check whether the implicit-function theorem is applicable. If so, write the equilibrium identity.

(c) Find $\partial P^* / \partial Y_0$ and $\partial P^* / \partial T_0$, and discuss their economic implications.

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第 2 頁, 共 2 頁

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科目	微積分	本科總分	100 分

6. (20 points) Use Cramer's rule to solve the following equation systems:

$$8x_1 - x_2 = 16$$

(a) $2x_2 + 5x_3 = 5$

$$2x_1 + 3x_3 = 7$$

$$-x_1 + 3x_2 + 2x_3 = 24$$

(b) $x_1 + x_3 = 6$

$$5x_2 - x_3 = 8$$

7. (10 points) Find the inverse of A using the formula $A^{-1} = \frac{1}{|A|}(\text{adj } A)$ if

$$A = \begin{bmatrix} 4 & 1 & -5 \\ -2 & 3 & 1 \\ 3 & -1 & 4 \end{bmatrix}.$$

8. (10 points) Given $A = \begin{bmatrix} -1 & 5 & 7 \\ 0 & -2 & 4 \end{bmatrix}$, $b = \begin{bmatrix} 9 \\ 6 \\ 0 \end{bmatrix}$, and $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$.

Calculate (1) Ab , (2) Aib , (3) $x'IA$, and (4) $x'A$.