

東吳大學 109 學年度暑假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	經濟數學	本科總分	100 分

※一律作答於答案卷上(題上作答不予計分)；並務必標明題號，依序作答。

1. (10 points) Find the (point) elasticity of demand, given $Q = k/(P^n)$, where $k > 0$, $n > 0$.

(a) Does the elasticity depend on the price in this case?

(b) In the special case where $n = 1$, what is the shape of the demand curve?

2. (10 points) Are the three vectors $v_1 = [1 \ 2]$, $v_2 = [3 \ 4]$, and $v_3 = [5 \ 6]$ linearly independent?

3. (20 points)

(a) Graph and check $y = f(x) = x^2$ ($x \geq 0$) for concavity and convexity.

(b) Check $y = f(x) = x^2$ ($x \geq 0$) for quasiconcavity and quasiconvexity.

(c) Check $z = f(x, y) = xy$ ($x, y \geq 0$) for quasiconcavity and quasiconvexity.

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

5. (10 points) Examine whether the following quadratic forms are positive definite, negative definite, or indefinite:

(a) $5x_1^2 + 3x_2^2 + 2x_3^2 - x_1x_2 + 8x_1x_3$

(b) $6x_1^2 + 25x_2^2 + 9x_3^2 - 60x_2x_3 + 40x_1x_3 - 6x_1x_2$

6. (20 points) Use the Lagrange-multiplier method to find the stationary values of z and determine whether it is a maximum or a minimum:

(a) $z = x - 3y - xy$, subject to $x + y = 6$.

(b) $z = 7 - y + x^2$, subject to $x + y = 0$.

7. (20 points) A goods market is described by the following set of equations:

$$Y = C(Y - T(Y)) + I(r) + G_0,$$

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第 2 頁，共 2 頁

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where Y is the level of national income, and C , I , G , and T are consumption, investment, government spending, and taxes, respectively. If we denote disposable income as $Y^d = Y - T$, then the consumption function can be expressed as: $C(Y^d)$, where $0 < C'(Y^d) < 1$ is the marginal propensity to consume. Investment spending is assumed to be a strictly decreasing function of the rate of interest, r : $I'(r) < 0$. The public sector is described by two variables: government spending (G) and taxes (T). Typically, government spending is assumed to be exogenous whereas taxes are assumed to be an increasing function of income: $0 < T'(Y) < 1$.

A money market is described by the following three equations: $M^d = L(Y, r)$, $M^s = M_0^s$, and $M^d = M^s$, where $L_Y > 0$, $L_r < 0$ and the money supply is assumed to be exogenously determined by the central monetary authority.

- (a) Derive the slope of the IS curve.
- (b) Derive the slope of the LM curve.
- (c) Derive the following two comparative-static derivatives: dY^*/dG_0 and dr^*/dG_0 .