

東吳大學 111 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

1. (10 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) $x_1 + x_3 = 6$

$$5x_2 - x_3 = 8$$

2. (15 points) Compute the determinant of A , where $A = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \end{bmatrix}$. How many solutions does the homogeneous equation $Ax = 0$ have?

3. (15 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.

4. (20 points) A *goods market* is described by the following set of equations:

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

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.

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第 2 頁，共 2 頁

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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 .

5. (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 $x + y = 0$.

6. (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.