

考試科目	Calculus	所別	Public Finance	考試時間	4月20日 星期日 下午第2節
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1. Consider the demand function $F(p, q) = p + pq + q = 0$. Find $\frac{dq}{dp}$.
(5 points)

2. Consider the linear demand curve $Q = a - bP$. Show that the elasticity of demand is equal to -1 at the midpoint of the demand curve. (5 points)

3. $y = \frac{e^{ax} - e^{-ax}}{e^{ax} + e^{-ax}}$. Find $\frac{dy}{dx}$. (10 points)

4. Given the production function $Q = f(L, K)$, the elasticity of substitution of K for L is defined as: $E = \frac{dr}{dp} \frac{p}{r}$, where $r = \frac{K}{L}$, and $p = \frac{\partial Q / \partial L}{\partial Q / \partial K}$. Further assume you are given the following production

function: $Q = 20\left(\frac{1}{4}L^{-1/4} + \frac{3}{4}K^{-1/4}\right)^4$, show that $E = \frac{4}{5}$. (10 points)

5. Find the extremal, if any, of the functional $V[y] = \int_1^5 [3t + (y')^{1/2}] dt$ with boundary conditions $y(1) = 3$ and $y(5) = 7$. (10 points)

6. Assume that A and r are positive constants in the function $V = Ae^{rt}$, so that in general form we can write $V = f(t)$. What can be said about the curvature of this function? (10 points)

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7. Suppose the supply function for a particular good is given (in NT dollars) by $S(q) = q^2 + 10q$, and the demand function is given by $D(q) = 900 - 20q - q^2$. Find the consumer's surplus and the producer's surplus. (10 points)

8. Evaluate $\int_1^2 \int_4^9 \frac{3+5y}{\sqrt{x}} dx dy$. (10 points)

9. Find the solution of the first-order differential equation $y' = \frac{xy}{x^2 + 1}$ that satisfies the condition $y(0) = 1$. (15 points)

10. A certain country's income distribution is described by the function $f(x) = \frac{15}{16}x^2 + \frac{1}{16}x$. (a) Sketch the Lorenz curve for this function. (5 points) (b) Compute the coefficient of inequality for the Lorenz curve. (10 points)

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