

National University of Ireland, Galway

Winter Examinations 1999/2000 SAMPLE PAPER

EC211 Introduction to Mathematical Economics

2nd B.A.

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Please answer four of the following questions. All questions carry equal marks.

Time allowed: **TWO hours**

Section A

1. Using matrix methods, solve the following equations for x_1 , x_2 and x_3 :

$$\begin{aligned} -18 - 2x_1 + 10x_3 &= 0 \\ 4x_1 + x_2 &= 5 + x_3 \\ 8x_3 &= 31 - 5x_2 \end{aligned}$$

2. Given the following Total Cost and Total Revenue functions:

$$\begin{aligned} TC &= Q^3 + 61.25Q^2 + 1528.5Q + 2000 \\ TR &= 1200Q - 2Q^2 \end{aligned}$$

Find the profit-maximizing level of output Q^* , being sure to show that a maximum, not a minimum, has been identified.

3. Find all the (first-order) partial derivatives for the following functions:

(a) $y = 4x_1^3 + 2x_1x_2^2 + x_1^4x_2x_3^2$

(b) $Y = 0.8K^{0.5}L^{0.5}$

(c) $U = x_1^\alpha x_2^{1-\alpha}$ where $0 < \alpha < 1$, is a constant.

4. Show, either for the general case, or for a specific functional form, that marginal cost intersects the average cost function at its minimum point.
5. Consider the following basic Keynesian model of the macro-economy:

$$\begin{aligned} Y &= C + I_0 + G_0 \\ C &= a + bY \end{aligned}$$

where Y and C are endogenous, I_0 and G_0 are exogenous constants, $a > 0$, and $0 < b < 1$.

- (a) Use matrix methods to solve for Y and C
 - (b) What is the response of equilibrium national income Y to a change in G_0 ?
6. A consumer maximizes her utility function $U = (x_1 + 2)(y + 1)$ subject to the usual constraint $M = p_1x_1 + p_2x_2$. Solve this problem for x_1^* , x_2^* and the Lagrange multiplier λ . Interpret λ for specific values of p_1 , p_2 and M .