Assignment 2

EC211 Introduction to Mathematical Economics

Dr Aidan Kane
Department of Economics
NUI, Galway

Due: 17.00hrs, Wednesday 20th October 1999

No extensions.

1. Find the derivative $\frac{d\,y}{d\,x}$ of the following functions:
   (a) $y = 3x^3 - 4x^2 + \frac{4}{x} + 23$
   (b) $y = (4x^2 + 3)x^{-1}$
   (c) $y = (2x + 11)(6x^2 - 5x)$
   (d) $y = \frac{ax^2+3b}{cx+4d}$
   (e) $y = x^2(4x + 5)$
   (f) $y = 5z^3 + z$, where $z = x^2 + 4$
   (g) $y = \frac{4}{z^2}$ where $z = 3x^3 + x^2$

2. The (own) price elasticity of demand ϵ_d ('epsilon' d) is the ratio of the percentage change in quantity demanded to the percentage change in price. In terms of derivatives, this amounts to:

$$\epsilon_d \equiv \frac{d\,Q/Q}{d\,P/P}$$

   From this, and given a demand function $Q = 70 - 3P$ find the price elasticity of demand, in general, for $P = 14$, and for $P = 35$.

3. Plot the total cost (TC) function

$$TC = Q^3 - 10Q^2 + 50$$

   as well as the associated average cost AC and marginal cost MC functions, in order to graphically illustrate the fact that when $MC < AC$, AC is falling, while when $MC > AC$, AC is rising, (for $Q > 0$)

4. Given a total cost (TC) function of the general form

$$TC = TC(Q)$$

where $Q > 0$, demonstrate the point made in the previous question for this general case.

5. 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) $Y = 0.8K^{0.3}L^{0.7}$

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

6. In part (c) of the previous question, what properties of this (utility) function does partial differentiation reveal?

7. For the macro model set out in Question 3 of Assignment 1, what is $\frac{\partial Y^*}{\partial G}$?