B.E. International Program

Faculty of Economics, Thammasat University

EE 320 Introductory Mathematical Economics (Section 046402)

Semester 1/2013

Homework 3

Due 26 September 2013

There are four questions in total. Each of them is worth 4 points.

1. *(1 point each)* Differentiate the following functions:

   a) $y = \frac{x^2-9x+20}{x-5}$

   b) $y = \sqrt{x+\sqrt{x}}$

   c) $y = \ln(e^x + x)$

   d) $y = x^4 e^x$

2. Given the total-product function:

$$Q = 2L + 5L^2 - L^3$$

   a) *(1 point)* Find the average product (AP) function.

   b) *(1 point)* Find the marginal product (MP) function.

   c) *(2 points)* Determine the slopes of the AP and MP functions. What can you conclude about their relative slopes?

3. Given the following function

$$f(x) = 2x^3 + 8x^2 - 32x - 50,$$

a) *(2 points)* Find the critical value(s) of *x* and the corresponding stationary value(s) of *f(x)*.

b) *(2 points)* Evaluate whether the stationary value(s) found in part a) are relative maxima or minima or inflection points by using the first-derivative test.

4. Let the total cost function be:

$$TC(Q) = 2Q^2 - 8Q + 10.$$

a) *(1 point)* Determine whether *TC(Q)* is a convex or concave function.

b) *(2 points)* Find the quantity *Q** that minimizes the total cost.

c) *(1 points)*Verify that *TC(Q*)* is the lowest cost by using the second derivative test.

5. Suppose that a firm produces a single commodity. Its demand and total-cost functions are:

$$Q = 70 - P$$

$$C(Q) = Q^2 - 10Q + 500.$$

a) *(1 point)* Set up a profit function, $\pi(Q)$.

b) *(2 points)* Find the value of *Q** that maximizes profit.

c) *(1 points)* Verify that the quantity *Q** found in part (b) gives a maximum profit.