

Unit 05a: Mathematics 1 – (MathB)

Assignment – 1

1. The supply equation for a good is $q = 2p^2 - 38p + 39$
and the demand equation is $q = 48 - 2p - p^2$
where p is the price.
Sketch the supply and the demand functions for $p \geq 0$
Determine the equilibrium price and quantity.

(12 Marks)

2. A monopolist's average cost function is given by :

$$2 + 3q - \frac{5}{q}$$

Where q is the quantity produced, the demand function for the

good is $q = 10 - \frac{p}{2}$

Determine expressions, in terms of q , for the revenue and
The profit and determine the value of q that maximizes the
profit. Find the maximum profit.

(10 Marks)

3. Solve each of the following equations/inequalities:

1. $-x^4 + 10x^2 - 9 = 0$

2. $8x^3 - 27 = 0$

3. $\sqrt{2x-1} = 2 - 3x$

4.
$$\begin{cases} -\frac{3}{4}x + 8y - 37 = 0 \\ -35 + 8x + \frac{3}{5}y = 0 \end{cases}$$

5. $|7x - 5| - 1 > 10$

6. $|8x + 1| - 13 < 4$

7. $e^x + 3e^{-x} = 4$

8. $\ln(3x+2) = \ln 4 - \ln(x+2)$

9. $(\ln x)^2 + \ln x^2 - 1 = 0$

10. Solve the system :

$$\ln x + \ln y = 0 \quad , \quad x + y = 2$$

(20 Marks)

4. Given that a company has a linear cost function and that it costs \$ 600 to produce 4 units and \$ 700 to produce 8 units. Determine the cost $C(x)$ of producing x units.
(10 Marks)

5. A computer manufacturer finds that when x millions of dollars are spent on research, the profit, $P(x)$, in millions of dollars, is given by $P(x) = 20 + 5\log_3(x+3)$. How much should be spent on research to make a profit of 40 million dollars?
(8 Marks)

6. (20 Marks)

The inverse supply and demand functions for a market are given by the equations

$$p^S(q) = 2q + 3 \quad \text{and} \quad p^D(q) = -q^2 - 2q + 8,$$

respectively.

- (a) Write $p^D(q)$ in completed square form and determine the coordinates and nature of the turning point of the curve $p = p^D(q)$.
- (b) Determine the p and q -intercepts of the curves $p = p^S(q)$ and $p = p^D(q)$.
- (c) Find the points of intersection of the curves $p = p^S(q)$ and $p = p^D(q)$. Hence, deduce the equilibrium price and quantity for this market.
- (d) Sketch both of these curves on the same axes clearly indicating which parts of these curves are economically meaningful.
7. A firm's total costs are $TC = \frac{1}{3}q^3 - 5q^2 + 30q$
- (i) Determine the firm's average cost (AC) function.
- (ii) Find the value of q that makes the firm's average cost minimum and find this minimum.
- (iii) Assume this firm operates in a perfectly competitive market and is able to sell its output at a price of £14 per unit. Determine its profit function.

(20 Marks)

END of QUESTIONS