

Monopoly

1. Total Cost Function: $TC = 900 + 40Q^2$

Demand function: $2Q = 48 - 0.08P$

Find profit maximizing price.

Given: $2Q = 48 - 0.08P \Rightarrow 600 - 25Q = P$

Total revenue: $TR = P \cdot Q = 600(600 - 25Q) Q$

$$= 600Q - 25Q^2$$

$$MR = \frac{\partial TR}{\partial Q} = 600 - 50Q$$

$$MC = \frac{\partial TC}{\partial Q} = 80Q$$

For profit maximisation:

$$MR = MC$$

$$\Rightarrow 600 - 50Q = 80Q$$

$$\Rightarrow 130Q = 600$$

$$\Rightarrow Q = 4.6$$

Putting Q in demand equation:

$$2 \times 4.6 = 48 - 0.08P$$

$$\Rightarrow 9.2 = 48 - 0.08P$$

$$\Rightarrow 0.08P = 38.8$$

$$\Rightarrow P = 485$$

(2)

<u>Q</u>	<u>A.C.</u>
50	15
200	6.5
250	5.5

The firm sells 50 units of Q in a high income market at price $P_1 = 10$ and 200 units of Q in a low income market at price $P_2 = 5$. Find the profit made by the firm.

$$\text{Total revenue} : R = R_1 + R_2$$

$$= Q_1 P_1 + Q_2 P_2$$

$$= 50 \times 10 + 200 \times 5$$

$$= 500 + 1000 = 1500$$

$$\text{Total cost} = \text{A.C. } Q = \text{A.C. } (Q_1 + Q_2)$$

$$= 5.5 \times 250$$

$$= 1375$$

$$\text{Profit} = TR - TC = 1500 - 1375 = 125$$

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- 3) A price discriminating monopolist has segmented the total market for his product into 3 submarkets with the following price elasticities of demand.

<u>Market</u>	<u>Price elasticity</u>
1	-1.5
2	-2.5
3	-4

If profit maximising price charged in market 2 is Rs 50, what are the profit maximising prices for market 1 and 3?

To maximise profits, monopolists should equate MC to MR in each of the three markets.

$$\therefore \underline{MC = MR_1 = MR_2 = MR_3}$$

It is known: $MR = P \left[1 + \frac{1}{|e_{pp}|} \right]$

Now P in market 2 is Rs 50

$$\therefore MR_2 = 50 \left[1 + \frac{1}{-2.5} \right] = 30$$

$$\text{Now, } MR_1 = MR_2 = MR_3 = 30$$

$$\therefore \text{In market 1, } MR_1 = 30 = P \left[1 + \frac{1}{-1.5} \right] \\ \Rightarrow P_1 = 90$$

$$\text{In market 3, } MR_3 = 30 = P \left[1 + \frac{1}{-4} \right] \\ \Rightarrow P_3 = 40$$

4. The demand function for a monopolist is given by
 $P = 50 - 2Q$. MC for the monopolist is Rs. 10.
 Compared to pricing under perfectly competitive market, what is the effect on income redistribution because of monopoly pricing?

for the monopolist $P = 50 - 2Q$

$$TR = PQ$$

$$= (50 - 2Q)Q$$

$$= 50Q - 2Q^2$$

$$MR = 50 - 4Q$$

$$MC = 10$$

$$MR = MC$$

$$50 - 4Q = 10$$

$$-4Q = 10 - 50$$

$$4Q = 50 - 10$$

$$4Q = 40$$

$$Q = \frac{40}{4} = 10$$

$$\text{and } P = 50 - 2 \times 10$$

$$P = 50 - 20$$

$$P = 30$$

(5)

Under perfect competition

$$P = MC$$

$$\therefore P = 10$$

$$\therefore \text{For } Q = 10$$

Expenditure by consumer under monopoly is

$$P \times Q = (10 \times 30) = \text{Rs.} 300$$

Under perfectly competitive market

$$P \times Q = 10 \times 10 = \text{Rs.} 100$$

Income distributed in favor of producers because of monopoly pricing is $(300 - 100) = \text{Rs.} 200/-$

This is a loss of consumer surplus in favor of producers.

(5)

Demand function for the monopolist is given by $P = 110 - 4Q$

Marginal cost for the monopolist is constant and is equal to Rs 10. If the industry converts into a perfectly competitive industry, what would be the equilibrium output?

In perfect competition $P = MC$

$$\text{So } P = MC = 10$$

$$\text{So } P = 110 - 4Q$$

$$4Q = 110 - P$$

$$Q = \frac{(110 - P)}{4} = \frac{(110 - 10)}{4} = \frac{100}{4} = 25 \text{ units.}$$

Phone:

$$\downarrow$$
$$MR = P \left(1 + \frac{1}{e}\right)$$

where MR= marginal revenue, p= price,
e= price elasticity of demand

Ansatz:

$$MR = \frac{\partial TR}{\partial Q}$$

$$TR = P \cdot Q$$

$$\therefore \frac{\partial TR}{\partial Q} = \frac{\partial P}{\partial Q} Q + P$$

$$\begin{aligned} \therefore MR &= P \left(1 + \frac{\partial P \cdot Q}{\partial Q \cdot P}\right) \\ &= P \left(1 + \frac{1}{e}\right) \\ &= P \left(1 - \frac{1}{|e|}\right) \end{aligned}$$