HL Ahuja

Contemporary → Diagrams

Layered & hosted → Numerical

Prob & Pictorial → Overall Sums/problem

Mathematical Approach

Henderson & Quandt → Math Eco

Menn + MEI

✓

question

1. A monopolist firm faces a demand with constant elasticity of −2.0. It has a constant marginal cost of $20 per unit and sets a price to maximize profit. If marginal cost should increase by 25 percent, would the price charged also rise by 25 percent?

$$e_{\bar{p}} = -2$$

$$MC = 20$$ (25%)

for a monopoly $$\frac{P-MC}{P} = -\frac{1}{e_d}$$

$$MC = \frac{P \cdot MC}{P}$$

$$P = \frac{MC}{\left(1 + \left(\frac{1}{e_d}\right)\right)}$$

1.25 MC → 2.5 MC

$$P = 2MC$$

$$P = 2(1.25 MC)$$

$$= MC$$

$$P = \frac{MC}{\frac{1}{2}} = 2MC$$

If MC ↑ 25%.

$$now → P = 2MC$$
$$P = 2 \times 25 = 50$$

MC Rise to

$$1.25 MC$$

$$\$ \, 25$$

Hence no change in Relation

Price are increase 25%

$$TR = P \cdot Q = P \cdot Q = (P)$$

Q2 A firm faces the following average revenue (demand) curve:

$$AR = P = 120 - 0.02Q$$

where Q is weekly production and P is price, measured in cents per unit. The firm's cost function is given by $C = 60Q + 25,000$. Assume that the firm maximizes profits.

a. What is the level of production, price, and total profit per week?

b. If the government decides to levy a tax of 14 cents per unit on this product, what will be the new level of production, price, and profit?

$$\boxed{TC} = 60Q + \boxed{25000}$$
$$\quad\quad VC \quad\quad FC$$

$$MC = 60$$

at eqm $MR = MC$

$$120 - 0.04Q = 60$$
$$60 = 0.04Q$$
$$Q = \frac{60 \times 1025}{0.04} = \boxed{1500}$$

Now, Substing Q in AR equation

$$P = 120 - (0.02)(1500)$$
$$= \boxed{90}$$

$$\Pi = 90 \cdot 1500 - (25000 + 60 \cdot 1500)$$
$$= \boxed{200}$$

Side work (top right):

$$TR = P \cdot Q$$
$$AR = \frac{TR}{Q} = \frac{PQ}{Q} = \boxed{P}$$

$$\Pi = PQ - Cost$$
$$Sales = (PQ) = \boxed{TR}$$

$$P = \boxed{120 - 0.02Q}$$
$$TR \rightarrow PQ = 120Q - 0.02Q^2$$
$$MR = \boxed{120 - 0.04Q}$$

(b) for tax of 20 cents / 14 cents:

$$P^* = \boxed{120 - 0.02Q - T}$$
$$MR = 120 - 0.04Q - T$$
$$T = 14$$
$$120 - 0.04Q - 14 = 60$$
$$Q = \boxed{1150}$$

Do the rest as same as @

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3 Suppose that an industry is characterized as follows:

$TC = 100 + 2q^2$	each firm's total cost function
$MC = 4q$	firm's marginal cost function
$P = 90 - 2Q$	industry demand curve
$MR = 90 - 4Q$	industry marginal revenue curve

a. If there is only one firm in the industry, find the monopoly price, quantity, and level of profit.

b. Find the price, quantity, and level of profit if the industry is competitive.

c. Graphically illustrate the demand curve, marginal revenue curve, marginal cost curve, and average cost curve. Identify the difference between the profit level of the monopoly and the profit level of the competitive industry in two different ways. Verify that the two are numerically equivalent.

$q = Q$

$PQ = 90Q - 2Q$

@ Monopoly

$MC = MR$
$$4q = 90 - 4Q$$
$$4Q = 90 - 4Q$$
$$Q = \boxed{11.25}$$

$$@ \quad P = 90 - 2 \cdot (11.25)$$
$$= \boxed{67.5}$$

Profit $\rightarrow TR - TC$
$$PQ - TC$$
$$= (11.25) - 100 - 2(11.25)^2$$

Profit $\Rightarrow TR - TC$
$= Pq - TC$
$= (87-5)(11-25) - 100 - 2$
$\Rightarrow$

⑥ Compulive

$P = MC$
$90 - 2q = 4q$
$6q = 90$
$q = 15$

$P = 4q = 60$
$TR = 900$
$\pi = 350$

$TC = 100 + 2(15)^2$
$= 550$

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4. Suppose a profit-maximizing monopolist is producing 800 units of output and is charging a price of $40 per unit.

a. If the elasticity of demand for the product is −2, find the marginal cost of the last unit produced.

b. What is the firm's percentage markup of price over marginal cost?

c. Suppose that the average cost of the last unit produced is $15 and the firm's fixed cost is $2000. Find the firm's profit.

$$\frac{P - MC}{P} = -\frac{1}{e_d}$$
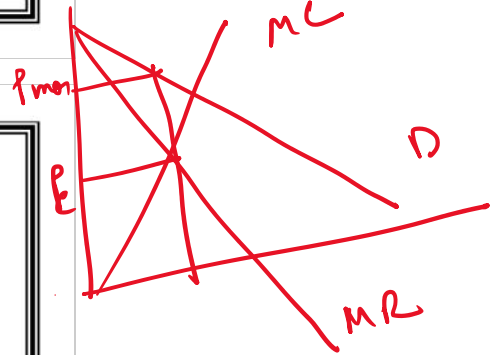
$$P = \frac{MC}{\left(1 + \frac{1}{e_d}\right)}$$

$$40 = \frac{MC}{\left(1 - \frac{1}{2}\right)}$$

$$\Rightarrow \boxed{20 = MC}$$

MC is 50% of price

Profit = 20,000

© $TR = 40 \times 800$
$= 32000$

$TC = AC \cdot q$
$= 15 \times 800$
$= 12000$

$PS = 20000 + 2000$
$= 22000$

8. A firm has two factories, for which costs are given by:

Factory #1: $C_1(Q_1) = 10Q_1^2$

Factory #2: $C_2(Q_2) = 20Q_2^2$

The firm faces the following demand curve:

$$P = 700 - 5Q$$

where Q is total output—i.e., $Q = Q_1 + Q_2$.

a. On a diagram, draw the marginal cost curves for the two factories, the average and marginal revenue curves, and the total marginal cost curve (i.e., the marginal cost of producing $Q = Q_1 + Q_2$). Indicate the profit-maximizing output for each factory, total output, and price.

b. Calculate the values of Q_1, Q_2, Q, and P that maximize profit.

c. Suppose that labor costs increase in Factory 1 but not in Factory 2. How should the firm adjust (i.e., raise, lower, or leave unchanged) the following: Output in Factory 1? Output in Factory 2? Total output? Price?

9. A drug company has a monopoly on a new patented medicine. The product can be made in either of two plants. The costs of production for the two plants are $MC_1 = 20 + 2Q_1$ and $MC_2 = 10 + 5Q_2$. The firm's estimate of demand for the product is $P = 20 - 3(Q_1 + Q_2)$. How much should the firm plan to produce in each plant? At what price should it plan to sell the product?

$(10 + 5Q)$ $20 + 2Q$

$D = AR$

MR
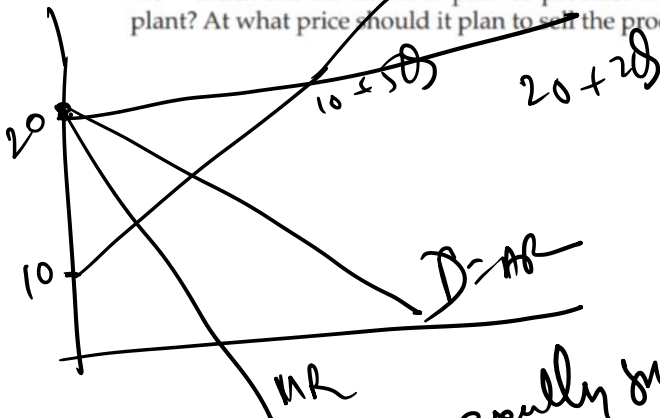
Early line is exactly lying @ the same point with the Price line

P_1 P_2 Production part

$Q_1 = Q_2$

MR = 2

$P = 20 - 3(Q_1 + Q_1)$

$P = 20 - 6Q_1$

$TR = 20Q_1 - 6Q_1^2$

$MR = 20 - 12Q_1$

$MR = MC_1$

$20 - 12Q_1 = 20 + 2Q_1$

$14Q_1 =$ $Q_1 = 0$

$P = MC$

π

$P > AVC$ ★★

11. A monopolist faces the demand curve $P = 11 - Q$, where P is measured in dollars per unit and Q in thousands of units. The monopolist has a constant average cost of $6 per unit.

a. Draw the average and marginal revenue curves and the average and marginal cost curves. What are the monopolist's profit-maximizing price and quantity? What is the resulting profit? Calculate the firm's degree of monopoly power using the Lerner index.

b. A government regulatory agency sets a price ceiling of $7 per unit. What quantity will be produced, and what will the firm's profit be? What happens to the degree of monopoly power?

c. What price ceiling yields the largest level of output? What is that level of output? What is the firm's degree of monopoly power at this price?

$P = 11 - Q$
$TR = 11Q - Q^2$
$MR = 11 - 2Q$
$AC = 6$
$TC = 6Q$
$MC = 6$

$11 - 2Q = 6$
$Q = 2.5$