EconS 301
Review Session #8 – Chapter 11: Monopoly and Monopsony

1. Which of the following describes a correct relation between price elasticity of demand and a monopolist's marginal revenue when inverse demand is linear, $P = a\text{-}bQ$?
   a) Demand is elastic when $Q > a/2b$.
   b) Demand is inelastic when $Q > a/b$.
   c) Demand is unit elastic when $P = a/2b$.
   d) Demand is elastic when $Q < a/2b$.

   Answer

   Recall that a monopolist maximizes profits when MR=MC. And recall that, given a linear demand, the marginal revenue will have a slope exactly twice as steep as the demand. Thus, we know that the marginal revue is $MR = a\text{-}2bQ$. So, at a quantity of $Q = a/2b$, we will have MR=0. This point is also exactly in the middle of the demand curve, where the demand is unitary elastic. And we know the monopolist will have a MR>0, thus they will be operating at a quantity less than $Q = a/2b$, and the answer is D.

2. In order to calculate the Lerner Index for a particular firm, you need to know ________ and ______ for that firm.
   a) marginal cost; marginal revenue
   b) marginal cost; price
   c) price; quantity
   d) price; demand

   Answer

   The learner index is given by, (P-MC)/P. Thus, the answer is B.

3. A monopolist owns two plants in which to produce a product which has inverse demand $P = (770/3) – 3Q$. The monopolist has marginal cost curves of $MC_1 = 20+3Q_1$ and $MC_2 = 10+6Q_2$ in the two plants, respectively. Which of the following represents the optimal outputs in the two plants, Q_1 and Q_2 and the market price?
   a) $Q_1 = 170/9; Q_2 = 100/9; P = 500/3.$
   b) $Q_1 = 100/9; Q_2 = 170/9; P = 500/3.$
   c) $Q_1 = 500/3; Q_2 = 170/9; P = 100/9.$
   d) $Q_1 = 500/3; Q_2 = 100/9; P = 170/9.$

   Answer

   First we need to find the total marginal cost by summing the two inverse marginal cost curves over quantity,

$$MC_1 = 20 + 3Q_1 \Rightarrow Q_1 = \frac{MC_1 - 20}{3}$$

$$MC_2 = 10 + 6Q_2 \Rightarrow Q_2 = \frac{MC_2 - 10}{6}$$

$$Q_1 + Q_2 = \frac{MC_1 - 20}{3} + \frac{MC_2 - 10}{6} = \frac{3MC_T - 50}{6}$$

solving for MC_T,

$$MC_T = 2Q_T + \frac{100}{6}$$

set up profit max condition $MC_T = MR$,

$$2Q_T + \frac{100}{6} = \frac{770}{3} - 6Q_T$$

$$Q_T = 30$$

$$P = \frac{770}{3} - 3(30) = \frac{500}{3}$$

$MC_T = 2(30) + \frac{100}{6} = \frac{230}{3}$ into inverse MC curves,

$$Q_1 = \frac{\left(\frac{230}{3}\right) - 20}{3} = \frac{170}{9}$$

$$Q_2 = \frac{\left(\frac{230}{3}\right) - 10}{6} = \frac{100}{9}$$

Thus, the answer is A.

4. The profit-maximizing monopsonist hires an optimal quantity of input (e.g. labor) so that
   a) the marginal expenditure on that input equals its marginal revenue product.
   b) the average expenditure on that input equals its average revenue product.
   c) the marginal expenditure on that input equals its average revenue product.
   d) the average expenditure on that input equals its marginal revenue product.

Answer

We know the monopolist will use an input until MC=MR. Thus, the answer is A.

5. A monopsonist only uses labor to produce an output according to production function $Q = 2L$, where Q is output and L is labor. The output sells for a price of $20 per unit. The supply curve for labor can be written $w = 4+L$. What is the monopsonist's demand for labor in this market?
   a) $L = 12.$
   b) $L = 18.$
   c) $L = 22.$
   d) $L = 24.$

Answer

The monopolist will use labor to the point where marginal expenditure is equal to marginal revenue product. Thus, we need to find these for labor.

$$ME_L = w + \left(\frac{\delta w}{\delta L}\right)L$$

$$ME_L = (4 + L) + L$$

$$ME_L = 4 + 2L$$

$$MRP_L = p\left(\frac{\delta Q}{\delta L}\right)$$

$$MRP_L = 20(2) = 40$$

$$ME_L = MRP_L$$

$$4 + 2L = 40$$

$$L = \frac{40 - 4}{2} = 18$$

Thus the answer is B.

WRITTEN EXERCISES

6. Assume that a monopolist sells a product with a total cost function

$$TC = 400 + Q^2$$

and a corresponding marginal cost function

$$MC = 2Q\,.$$

The market demand curve is given by the equation $P = 500 - Q$.

a) Find the profit-maximizing output and price for this monopolist. Is the monopolist profitable?

Answer

To find the profit-maximizing price and quantity, set $MR = MC$.

$$MR = 500 - 2Q$$

$$MC = 2Q$$

$$2Q = 500 - 2Q$$

$$4Q = 500$$

$$Q = 125$$

Plug Q into the demand curve to find P .

$$P = 500 - Q$$
$$P = 500 - 125$$
$$P = 375$$

Profit equals total revenue minus total cost.

$$\pi = PQ - TC$$
$$\pi = 125(375) - (400 + 125^2)$$
$$\pi = 46,875 - 400 - 15,625$$
$$\pi = 30,852$$

Yes, the monopolist is profitable.

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b) Calculate the price elasticity of demand at the monopolist's profit-maximizing price. Also calculate the marginal cost at the monopolist's profit-maximizing output. Verify that the IEPR rule holds.

Answer

The price elasticity of demand at the profit-maximizing price is -3.

$$\varepsilon_{Q,P} = \frac{\Delta Q}{\Delta P}\frac{P}{Q}$$
$$\varepsilon_{Q,P} = -1\left(\frac{375}{125}\right) = -3$$

The marginal cost when $Q = 125$ equals $2Q = 2(125) = 250$. Therefore, the IEPR rule holds.

$$IEPR \Rightarrow \frac{P - MC}{P} = -\frac{1}{\varepsilon_{Q,P}}$$
$$\frac{375 - 250}{375} = -\frac{1}{-3}$$
$$\frac{1}{3} = \frac{1}{3}$$

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7. Suppose a monopolist faces demand $Q^d = 200 - 5P$ and has a constant marginal cost of $5.

a) What price should the monopolist charge to maximize its profits?

Answer

To find the profit-maximizing price, set $MR = MC$.

$$\begin{aligned} Q &= 200 - 5P \\ 5P &= 200 - Q \\ P &= 40 - 0.20Q \\ MR &= 40 - 0.40Q \end{aligned}$$

$$\begin{aligned} 40 - 0.40Q &= 5 \\ Q &= 87.5 \end{aligned}$$

At $Q = 87.5$, the monopolist will charge a price $P = 40 - 0.20(87.5) = 22.50$.

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b) What is the Lerner Index of Market Power for this monopolist?

Answer

To calculate the Lerner Index, calculate

$$\begin{aligned} L &= \frac{P - MC}{P} \\ L &= \frac{22.50 - 5}{22.5} \\ L &= 0.78 \end{aligned}$$

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