

## Problem Set Seven Solutions

### Chapter 9

1. Two car manufacturers, Saab and Volvo, have fixed costs of \$1 billion and constant marginal costs of \$10,000 per car. If Saab produces 50,000 cars per year and Volvo produces 200,000, calculate the average fixed cost and average total cost for each company. On the basis of these costs, which company's market share should grow in relative terms?

*Answer:* Average total cost is average fixed cost plus marginal cost:  $ATC = FC/Q + MC$ . Volvo's average fixed cost  $\$1 \text{ billion}/200,000 = 5,000$  is much less than Saab's average fixed cost  $\$1 \text{ billion}/50,000 = 20,000$  due to producing more cars. Volvo's average production cost \$15,000 is lower than Saab's of \$30,000 by the difference in average fixed costs. Volvo's market share should grow relative to Saab's.

6. What is the socially desirable price for a natural monopoly to charge? Why will a natural monopoly that attempts to charge the socially optimal price invariably suffer an economic loss?

*Answer:* The socially desirable price to charge is the one at which the marginal benefit to consumers equals the marginal cost of production. However, natural monopolies usually have very large fixed costs and relatively low marginal costs. The high fixed costs mean that average cost is greater than marginal cost, so that charging a price equal to marginal cost implies economic losses.

8. Suppose that Aggieland Cinema is a local monopoly whose demand curve for regular adult tickets on Saturday night is  $P = 12 - 2Q$ , where  $P$  is the price of a ticket in dollars and  $Q$  is the number of tickets sold *in hundreds*. The demand for student tickets on Sunday afternoon is  $P = 8 - 3Q$ , and for regular adult tickets on Sunday afternoon,  $P = 10 - 4Q$ . On both Saturday night and Sunday afternoon, the marginal cost of an additional patron, student or not, is \$2.

a. What is the marginal revenue curve in each of the three markets?

*Answer:* The marginal revenue curves are  $MR = 12 - 4Q$  adult Saturday night,  $MR = 8 - 6Q$  student Sunday afternoon, and  $MR = 10 - 8Q$  adult Sunday afternoon.

b. What price should the cinema charge in each of the three markets to maximize profits?

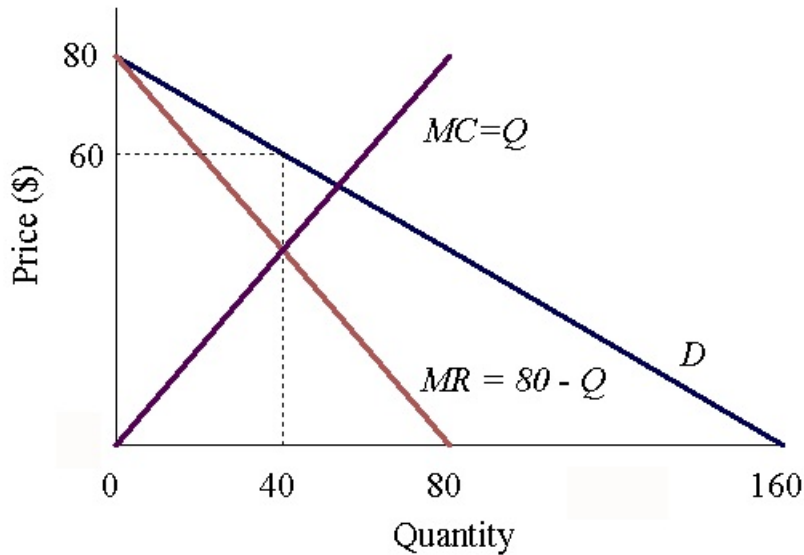
*Answer:* The cinema should pick quantity to set marginal revenue equal to marginal cost in each market and then set price for that quantity based on the demand curve for each market:

$12 - 4Q = 2$  yields  $Q = 250$ , so  $P = 12 - 2Q = 12 - 5 = \$7$  for regular adults on Saturday night.

$8 - 6Q = 2$  yields  $Q = 100$ , so  $P = 8 - 3Q = 8 - 3 = \$5$  for students on Sunday afternoon.

$10 - 8Q = 2$  yields  $Q = 100$ , so  $P = 10 - 4Q = 10 - 4 = \$6$  for regular adults on Sunday afternoon.

9. Suppose you are a monopolist in the market for a specific video game. Your demand curve is given by  $P = 80 - Q/2$ , and your marginal cost curve is  $MC = Q$ . Your fixed costs equal \$400.
- a. **Graph** the demand and marginal cost curve.



- b. Derive and **graph** (above) the marginal revenue curve.

*Answer:*  $MR = 80 - Q$  graphed above.

- c. Calculate and indicate on the **graph** the equilibrium price and quantity.

*Answer:* Pick quantity to set marginal revenue equal to marginal cost:  $80 - Q = Q$  so  $Q = 40$ . Set price for that quantity based on the demand curve  $P = 80 - Q/2 = 80 - 40/2 = 80 - 20 = 60$ .

- d. What is your profit?

*Answer:* Total revenue is price times quantity  $TR = PQ = (60)(40) = 2400$ . Total cost is fixed cost plus average marginal cost times quantity  $TC = 400 + (40)(40)/2 = 400 + 800 = 1200$ . Profit = total revenue - total cost =  $2400 - 1200 = 1200$ .

- e. What is the level of consumer surplus?

*Answer:* Consumer surplus is  $(1/2)(80 - 60)(40) = 400$ .

10. Beth is a second-grader who sells lemonade on a street corner in your neighborhood. Each cup of lemonade costs Beth 20 cents to produce; she has no fixed costs. The reservation prices for the 10 people who walk by Beth's lemonade stand each hour are listed in the table below. Beth knows the distribution of reservation prices (that is, she knows one person is willing to pay \$1.00, another \$0.90, and so on), but does not know any specific individual's reservation price.

a. Calculate the marginal revenue of selling an additional cup of lemonade. (Start by figuring out the price Beth would charge if she produced only one cup of lemonade, and calculate the total revenue; then find the price she would charge if she sold two cups of lemonade; and so on.)

Person	A	B	C	D	E	F	G	H	I	J
Reservation price	\$1.00	\$0.90	\$0.80	\$0.70	\$0.60	\$0.50	\$0.40	\$0.30	\$0.20	\$0.10
Quantity in cups	1	2	3	4	5	6	7	8	9	10
Total revenue	\$1.00	\$1.80	\$2.40	\$2.80	\$3.00	\$3.00	\$2.80	\$2.40	\$1.80	\$1.00
Marginal revenue	\$1.00	\$0.80	\$0.60	\$0.40	\$0.20	\$0	-\$0.20	-\$0.40	-\$0.60	-\$0.80

b. What is Beth's profit maximizing price and quantity?

*Answer:* MR = MC at a price of \$0.60 and quantity of 5 cups.

c. At that price, what are Beth's economic profit and total consumer surplus?

*Answer:* Profit = (P - MC) Q = (0.60 - 0.20) 5 = \$2. Consumer surplus is reservation price minus actual price for each cup sold: (\$1.00 - \$0.60) + (\$0.90 - \$0.60) + (\$0.80 - \$0.60) + (\$0.70 - \$0.60) = \$1.

d. What price should Beth charge if she wants to maximize total economic surplus? What quantity would she sell? How much would total economic surplus be?

*Answer:* She should set P = MC = \$0.20. Nine (or eight) cups of lemonade would be sold. Total economic surplus is reservation price minus marginal cost for each cup sold: (\$1.00 - \$0.20) + (\$0.90 - \$0.20) + (\$0.80 - \$0.20) + (\$0.70 - \$0.20) + (\$0.60 - \$0.20) + (\$0.50 - \$0.20) + (\$0.40 - \$0.20) + (\$0.30 - \$0.20) = \$3.60.

e. Now suppose Beth can tell the reservation price of each person. What price would she charge each person if she wanted to maximize profit? Compare her profit to the total surplus calculated in part d.

*Answer:* She would charge persons A through I (but not J) their respective reservation prices. Doing so would earn a profit of \$3.60, which is the same as the total economic surplus in part d.