

**BAYLOR UNIVERSITY**  
**HANKAMER SCHOOL OF BUSINESS**  
**DEPARTMENT OF ECONOMICS**

ECO 5315 Chapter 2 Problem Set Solutions

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**Solutions for assigned problems from Chapter 2 (problems 2, 6, 7-9 on pp. 20-22)**

2. The Johnson Robot Company's marketing managers estimate that the demand curve for the company's robots in 2008 is

$$P = 3,000 - 40Q$$

where  $P$  is the price of a robot and  $Q$  is the number sold per month.

- a. Derive the marginal revenue curve for the firm.

**Solution:** Total revenue ( $TR$ ) =  $PQ = (3,000 - 40Q)Q = 3,000Q - 40Q^2$ ; therefore, Marginal Revenue ( $MR$ ) =  $dTR/dQ = 3,000 - 80Q$ .

- b. At what prices is the demand for the firm's product price elastic?

**Solution:** The price elasticity of demand is given by the equation  $\eta = \frac{P}{Q} \frac{dQ}{dP}$ . Since  $P$

=  $3,000 - 40Q$ , this implies that  $Q = 7.5 - .025P \Rightarrow \frac{dQ}{dP} = -.025$ . Demand is price

elastic so long as  $\eta < -1$ . Since  $\frac{dQ}{dP} = -.025$ , then the price at which we have unitary

price elasticity occurs when  $P/Q = 40 = \frac{3000 - 40Q}{Q} \Rightarrow \frac{3000}{Q} - 40 = 40 \Rightarrow Q = 37.5$ .

When  $Q = 37.5$ ,  $P = 3,000 - 40Q = 3,000 - 40(37.5) = \$1,500$ . Therefore, the demand for the firm's product is price elastic whenever  $P \geq \$1,500$ .

- c. If the firm wants to maximize its dollar sales volume, what price should it charge?

**Solution:** As shown in Figure 2.7 on page 46, revenue is maximized whenever we have unitary elasticity. Therefore, the price the firm should charge is \$1,500.

4. The Haas Corporation's executive vice president circulates a memo to the firm's top management in which he argues for a reduction in the price of the firm's product. He says such a price cut will increase the firm's sales and profits.

a. The firm's marketing manager responds with a memo pointing out that the price elasticity of demand for the firm's product is about -0.5. Why is this fact relevant?

**Solution:** Whether total revenue will go up or down when the product price is lowered and more units are sold depends on whether the quantity of units sold increases by a greater percentage than the price is reduced by. That is, it depends on whether the demand is elastic or inelastic.

b. The firm's president concurs with the opinion of the executive vice president. Is she correct?

**Solution:** Assuming that the marketing manager is correct that the demand elasticity is -0.5, then a price reduction will cause the number of units sold to increase by a smaller percentage than the price has fallen, and both the president and executive vice president will have egg on their faces when total revenues decline after the price is reduced.

5. Managers of the Hanover Manufacturing Company believe the demand curve for its product is

$$P = 5 - Q$$

where  $P$  is the price of its product (in dollars), and  $Q$  is the number of millions of units of its product sold per day. It is currently charging \$1 per unit for its product.

a. Evaluate the wisdom of the firm's pricing policy.

**Solution:**  $TR = (5 - Q)Q = 5Q - Q^2 \Rightarrow MR = 5 - 2Q$ . At the current \$1 price,  $MR = -3$ . There, the current price is too low; increasing the price and selling fewer units would increase revenues.

b. A marketing specialist says that the price elasticity of demand for the firm's product is -1.0. Is this correct?

**Solution:** No, it is not correct. Note that  $P = 5 - Q \Rightarrow Q = 5 - P \Rightarrow dQ/dP = -1$ . At the current price of \$1 per unit,  $Q = 5 - P = 4$ , implying an elasticity measure of  $(dQ/dP)(P/Q) = -1(1/4) = -0.25$ .

7. According to S. Sackrin of the U.S. Department of Agriculture, the price elasticity of demand for cigarettes is between -0.3 and -0.4, and the income elasticity of demand is

about 0.5.

- a. Suppose the federal government, influenced by findings that link cigarettes and cancer, were to impose a tax on cigarettes that increased their price by 15 percent. What effect would this have on cigarette consumption?

**Solution:** Since the price elasticity of demand for cigarettes is between -0.3 and -0.4, a 15 percent tax would cause cigarette consumption to fall between  $-0.3(15\%) = 4.5\%$  and  $-0.4(15\%) = 6.0\%$  percent.

- b. Suppose a brokerage house advised you to buy cigarette stocks because if incomes were to rise by 50 percent in the next decade, cigarette sales would be bound to spurt enormously. What would be your reaction to this advice?

**Solution:** Assuming that the prices of cigarettes were to remain constant, a 50 percent increase in income would cause sales of cigarettes to increase  $0.5(50\%) = 25\%$  percent. The weighted average of all income elasticities equals 1, so consumption of noncigarette items would increase by more than 50 percent and certainly more than the 25 percent performance of cigarettes. I would not follow the broker's advice.

10. The Schmidt Corporation estimates that its demand function is

$$Q = 400 - 3P + 4I + 0.6A$$

where  $Q$  is the quantity demanded per month,  $P$  is the product's price (in dollars),  $I$  is per capita disposable income (in thousands of dollars), and  $A$  is the firm's advertising expenditures (in thousands of dollars per month). Population is assumed to be constant.

- a. During the next decade, per capita disposable income is expected to increase by \$5,000. What effect will this have on the firm's sales?

**Solution:** Sales will increase by 20 units per month (note that  $4I = 4(5) = 20$  units).

- b. If Schmidt wants to raise its price enough to offset the effect of the increase in per capita disposable income, by how much must it raise its price?

**Solution:** Price must be increased by \$6.67 per unit (note that  $-3P = -20$  units =  $3(6.67)$ ).

- c. If Schmidt raises its price by this amount, will it increase or decrease the price elasticity of demand? Explain. Make sure your answers reflect the fact that elasticity is a negative number.

**Solution:** Two interpretations are possible here, both of which lead to more elastic

demand. You could assume that the question is asking whether demand is more elastic after both the income and price have increased. Since  $dQ/dP$  is unchanged and  $P/Q$  has increased, the demand will become more elastic. Alternatively, if you assume that the question is asking whether demand becomes more or less elastic as we increase the price (so as to “choke off” the anticipated increase in the quantity demanded after an increase in income), then the answer is that demand will become more elastic. Simply involves moving up a linear demand curve implies an increasingly elastic demand.