BAYLOR UNIVERSITY
HANKAMER SCHOOL OF BUSINESS
DEPARTMENT OF ECONOMICS

Managerial Economics
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Sample Midterm Exam
Fall 2009

Chapter 1 (3 problems)

Use the following information to answer questions 1-3.

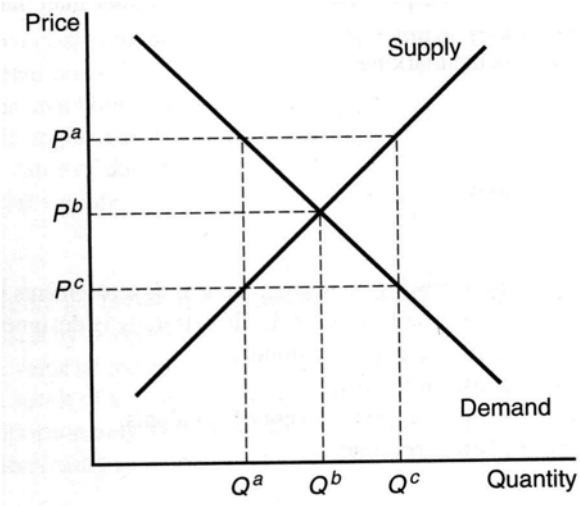


Figure 1

1. In Figure 1, the equilibrium price and quantity are
   A. P^a and Q^a.
   B. P^b and Q^b.
   C. P^c and Q^c.
   D. P^a and Q^c.
   E. P^c and Q^a.

2. In Figure 1, there will be an excess supply at any price
   A. above P^b.
   B. below P^b.
   C. other than P^b.
   D. below P^a.
   E. above P^c.

3. In Figure 1, there will be an excess demand at any price

   A. below P^a.
   B. <u>below P^b.</u>
   C. other than P^b.
   D. above P^b.
   E. above P^c.

Chapter 2 (3 problems)

4. The demand for fashion watches is $Q = 9 - 0.7P + 2I$. Assume that per capita income I is \$13. When the price of fashion watches is $P = \$30$, the price elasticity of demand is

   A. -0.66.
   B. -1.0.
   C. -2.0.
   D. -0.5.
   E. <u>-1.5.</u>

> **<u>Note:</u>** Since per capita income I is \$13 $\Rightarrow Q = 35 - 0.7P$; $\therefore\ dQ / dP = -0.7$. Since $P = \$30$, $Q = 35 - 0.7P = 35 - 21 = 14$. Thus, the price elasticity of demand, $\eta = -0.7(30/14) = -1.5$.

5. Along a linear demand curve, total revenue is maximized

   A. where the slope of a line from the origin to the demand curve is equal to the elasticity.
   B. <u>where the elasticity is -1.</u>
   C. near the quantity axis intercept.
   D. near the price axis intercept.
   E. where the elasticity is 0.

> **<u>Note:</u>** See equation Figure 2.7, p. 46 in the textbook.

6. "Colombia, Brazil Advance Proposal to Withhold 10 Percent of Export Output" (*Wall Street Journal*, September 23, 1991, p. B6). A Colombian delegate to the International Coffee Organization said that if all its members withheld 10 percent of export output, the international price would rise 20 percent. This statement implies the price elasticity of demand for coffee is approximately

   A. -0.00.
   B. -5.00.
   C. -2.00.
   D. -0.20.
   E. <u>-0.50.</u>

> **<u>Note:</u>** $\eta = \%\Delta Q / \%\Delta P = -10\% / 20\% = -0.5$.

Chapter 4 (3 problems)

7. The marginal product of labor can be illustrated geometrically as the

   A. <u>slope of the total product curve with respect to labor.</u>
   B. slope of the total product curve with respect to capital.
   C. slope of a chord from the origin out to the total product curve at the specified level of labor.
   D. inverse of the slope of a chord from the origin out to the total product curve at the specified level of labor.
   E. slope of the total product curve with respect to labor divided by the slope of the total product curve with respect to capital.

8. If output is produced according to $Q = 12K^{.5}L^{.5}$, the price of K is \$2, the price of labor is \$2, and the price of Q is \$100, the marginal profit at the optimal combination of inputs that cost \$100 is

A. \$99.67.
B. \$299.
C. \$598.
D. \$0.
E. \$597.

In chapter 4, we learned that the optimal combination of inputs for a given cost occurs at the point of tangency between the isocost line and the isoquant. The L, K combination at the point of tangency is found by setting the ratios of marginal products to prices for labor and capital equal to each other (see equation (4.6), p. 110 in the textbook); i.e., set

$$MP_L/P_L = MP_K/P_K \text{—>} MP_L/2 = MP_K/2 \text{—>} MP_L = MP_K.$$

Applying the power rule, the product of labor is $MP_L = .5(12)K^{.5}L^{-.5}$,and the marginal product of capital is $MP_K = .5(12)K^{-.5}L^{.5}$. Thus,

$$MP_L = MP_K \text{—>} .5(12)K^{.5}L^{-.5} = .5(12)K^{-.5}L^{.5} \text{—>} K^{.5}L^{-.5} = K^{-.5}L^{.5} \text{—>} K = L.$$

Since the amount budgeted for labor and capital is \$100 and each unit of capital and labor costs \$2, this means that we will optimally employ 25 units of capital and 25 units of labor. This will enable us to produce $Q = 12K^{.5}L^{.5} = 12(25^{.5})(25^{.5}) = 300$ units of output.

The question calls for determining marginal profit at the optimal combination of inputs that cost \$100. We know that marginal revenue from selling one more unit of output is \$100; this is given in the problem. Since marginal profit is the difference between marginal revenue and marginal cost, we must determine marginal cost in order to answer this question. On page 135 of the textbook, it is shown that the marginal cost of an input can be determined by dividing the cost per unit of input by the input's marginal product. It follows then that the marginal cost of output at the optimal input combination is given by the price of the variable input (in this case, labor) divided by its marginal product. Thus $MC = P_L/MP_L = \$2/6K^{.5}L^{-.5}$. However, since the optimal combination of inputs involves one unit of capital per unit of labor, we substitute K in place of L in the marginal cost equation and find that $MC = \$2/6K^{.5}L^{-.5} = \$1/3K^{.5}K^{-.5} = \$0.33$. Thus marginal profit is $MR - MC = \$100 - \$0.33 = \$99.67$

9. If rice can be produced using water and seed according to $Q = WS$, water costs \$3 and seed costs \$3, what is the cost minimizing combination of water and seed capable of producing 144 units of rice?

A. $W = 64$, $S = 0$.
B. $W = 0$, $S = 64$
C. $W = 1$, $S = 64$.
D. $W = 8$, $S = 8$.
E. $W = 12$, $S = 12$.

Note: The key here (as in the previous problem) is to set the ratios of marginal products to prices for water and seed equal to each other. Given the production function $Q = WS$, the marginal product of water is S and the marginal product of seed is W. Therefore, $\frac{S}{3} = \frac{W}{3} \Rightarrow S = W$; i.e., the cost minimizing combination is to use 1 part of seed to 1 part of water. Therefore, in order to produce 144 units of rice, you need to use 12 seeds and 12 units of water.

Chapter 5 (3 problems)

10. If Hilltop Turf Farm's total cost of producing acres of sod is $TC = 0.2Q^2 + 120Q + 5{,}000$, the marginal cost of producing the fiftieth acre of sod is

A. \$110.
B. \$120.
C. \$130.
D. \$140.
E. \$150.

Note: $MC = 0.4Q + 120; \therefore MC(@\, Q = 50) = 0.4(50) + 120 = \$140.$

11. If total cost is given by $TC = a + bQ - cQ^2 + dQ^3$, then average variable cost is minimized at _____ units of output.

A. $Q^* = a / 2d$
B. $Q^* = b / 2d$
C. $Q^* = c / 3d$
D. $Q^* = c / 2d$
E. $Q^* = d / 2c$

Note: Variable cost, $VC = bQ - cQ^2 + dQ^3$; therefore, average variable cost, $AVC = b - cQ + dQ^2$. $dAVC / dQ = -c + 2dQ = 0; \therefore Q^* = c / 2d$.

Chapter 6 (3 problems)

The following information applies to problems 15 and 16: Suppose a representative firm exists with total cost given by $TC = 20 + 20q + 5q^2$. This firm operates in a competitive industry where the short-run market demand and supply curves are given by $Q_D = 1{,}400 - 40P$ and $Q_S = -400 + 20P$.

12. The short-run profit maximizing level of output for this firm is:

A. 1 unit.
B. 2 units.
C. 4 units.
D. 5 units.
E. 6 units.

Note: Setting $Q_D = Q_S \Rightarrow 1{,}400 - 40P = -400 + 20P \Rightarrow P = 30$. In a short-run equilibrium $P = MC$; $MC = 20 + 10q$; $\therefore 20 + 10q = 30 \Rightarrow$ short-run profit maximizing level of output = 1 unit.

13. If this firm continues to operate in the long run, its profit maximizing level of output will be:

A. 1 unit.
B. 2 units.
C. 4 units.
D. 5 units.
E. 6 units.

Note: In the long-run, firms in competitive industries minimize average cost. Since $TC = 20 + 20q + 5q^2$, $AC = 20q^{-1} + 20 + 5q$. $dAC / dq = -20q^{-2} + 5 = 0 \Rightarrow q = 2$ units.

14. Kenny's Cartage hauls crushed stone for $15 a ton and has total costs given by $TC = 100 + 5Q + Q^2$. The profit maximizing level of output is

A. 5 tons.
B. 2.1 tons.
C. 10 tons.
D. 20 tons.
E. 0 tons.

Note: $\pi = 15Q - 100 - 5Q - Q^2 = 10Q - 100 - Q^2$; thus, marginal $\pi = 10 - 2Q = 0$, and $Q = 5$.

Chapter 7 (4 problems)

15. In the model of monopoly, there

A. are many firms producing differentiated products.
B. are a few firms producing undifferentiated products.
C. are a few firms producing differentiated products.
D. are many firms producing undifferentiated products.
E. is one firm producing a highly differentiated product.

16. Craig's Red Sea Restaurant is the only restaurant in Columbia, South Carolina, that sells Ethiopian food. The demand for Ethiopian food is given by $Q = 25 - P$. Craig's costs are given by $TC = 25 + Q + 5Q^2$. Its maximum monopoly profit is

A. -$1.
B. $21.
C. $22.
D. $24.
E. $26.

Note: Set $MR = MC$. Since $TR = (25-Q)Q = 25Q - Q^2$, $MR = 25 - 2Q$. Since $TC = 25 + Q + 5Q^2$, $MC = 1 + 10Q$. Therefore, $25 - 2Q = 1 + 10Q \Rightarrow Q = 2$. Therefore, $\pi = TR - TC = 25(2) - 2^2 - 25 - 2 - 5(2^2) = -\$1$.

17. If a monopolist faces a constant elasticity of demand curve given by $Q = 202{,}500P^{-3}$ and has total costs given by $TC = 10Q$, its profit maximizing level of output is

A. 50.
B. 60.
C. 75.
D. 100.
E. 120.

Note: $\eta = (dQ/dP)(P/Q) = -3(202,500)P^{-4}P^{1}202,500^{-1}P^{3} = -3$. For the monopolist, $P = MC/[1+(1/\eta)]$. Here, $MC = 10$. Therefore, $P = 10/[1+(1/(-3)] = 15$, so $Q = 202{,}500P^{-3} = 202{,}500(15^{-3}) = 60$.

18. If elasticity of demand is -3, marginal cost is $5, and average cost is $7, the price at which profit is maximized is

A. $5.
B. $6.25.
C. $7.50.
D. $8.75.
E. $10.

Note: See equation (7.3), p. 207 in the textbook. This equation indicates that the profit maximizing price is $P = MC/[1+(1/\eta)]$, where η is the price elasticity of demand. Therefore, $P = 5/[1+(1/(-3))] = \$7.50$.

Chapter 10 (4 problems)

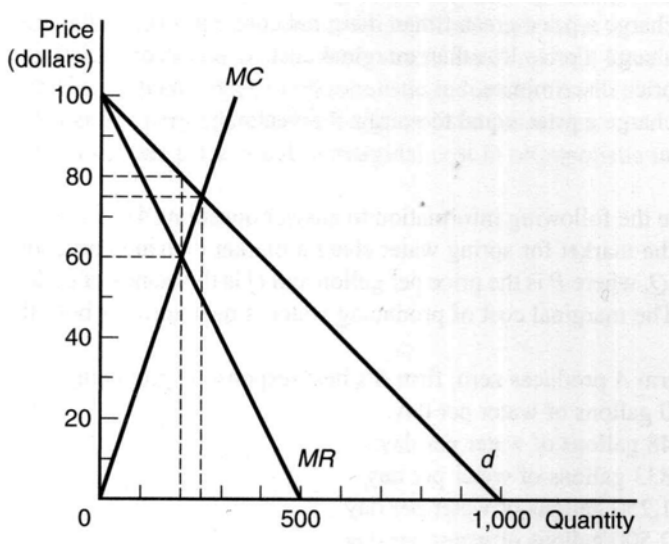
19. In the United States most cartels were declared illegal by the

A. Sherman Antitrust Act.
B. Interstate Commerce Commission.
C. Supreme Court.
D. Constitution.
E. Declaration of Independence.

20. When an economist says an oligopoly has a "small" number of firms, the economist means

A. exactly 1.
B. exactly 2, 3, or 4.
C. few enough to allow for interdependence.
D. few enough to allow for perfectly inelastic demand curves.
E. few enough to allow for four stages of industry development.

Use the following information to answer questions 26-27.



21. The optimal output and price for the cartel shown in the diagram is

A. Q = 200 and P = $80.
B. Q = 260 and P = $60.
C. Q = 250 and P = $80.
D. Q = 250 and P = $75.

Note: The cartel sets $MR = MC$, which corresponds to the 200, $80 quantity-price pair.

22. If the cartel described by the diagram is broken up and forced into a perfectly competitive market situation, the optimal output and price will be

A. Q = 200 and P = $80.
B. Q = 260 and P = $60.
C. Q = 250 and P = $80.
D. Q = 250 and P = $75.

Note: In a perfectly competitive market, $P = MC$ in equilibrium, which corresponds to the 250, $75 quantity-price pair.