Chapter 8: Answers to Questions and Problems

1.

a. 7 units.
b. $28.
c. $224, since $32 x 7 = $224.
d. $98, since $14 x 7 = $98.
e. $126 (the difference between total cost and variable cost).
f. It is earning a loss of $28, since ($28 -$32) x 7 = - $28.
g. - $126, since its loss will equal its fixed costs.
h. Shut down.

2.

a. Set P = MC to get $80 = 8 + 4Q. Solve for Q to get Q = 18 units.
b. $80.
c. Revenues are R = ($80)(18) = $1440, costs are C = 40 + 8(18) + $2(18)^2$ = $832, so profits are $608.
d. Entry will occur, the market price will fall, and the firm should plan to reduce its output. In the long-run, economic profits will shrink to zero.

3.

a. 7 units.
b. $130.
c. $140, since ($130 – 110) x 7 = $140.
d. This firm's demand will decrease over time as new firms enter the market. In the long-run, economic profits will shrink to zero.

4.

a. MR = 200 – 4Q and MC = 6Q. Setting MR = MC yields 200 – 4Q = 6Q. Solving yields Q = 20 units. The profit-maximizing price is obtained by plugging this into the demand equation to get P = 200 - 2(20) = $160.
b. Revenues are R = ($160)(20) = $3200 and costs are C = 2000 + $3(20)^2$ = $3200, so the firm's profits are zero.
c. Elastic.
d. TR is maximized when MR = 0. Setting MR = 0 yields 200 – 4Q = 0. Solving for Q yields Q = 50 units. The price at this output is P = 200 – 2(50) = $100.
e. Using the results from part d, the firm's maximum revenues are R = ($100)(50) = $5,000.
f. Unit elastic.

5.

a. A perfectly competitive firm's supply curve is its marginal cost curve above the minimum of its AVC curve. Here, $MC_i = 50 - 8q_i + 3q_i^2$ and $AVC_i = \frac{50q_i - 4q_i^2 + q_i^3}{q_i} = 50 - 4q_i + q_i^2$. Since MC and AVC are equal at the minimum point of AVC, set $MC_i = AVC_i$ to get $50 - 8q_i + 3q_i^2 = 50 - 4q_i + q_i^2$, or $q_i = 2$. Thus, AVC is minimized at an output of 2 units, and the corresponding AVC is $AVC_i = 50 - 4(2) + (2)^2 = 46$. Thus the firm's supply curve is described by the equation $MC = 50 - 8q_i + 3q_i^2$ if $P \geq \$46$; otherwise, the firm produces zero units.

b. A monopolist produces where MR = MC and thus does not have a supply curve.

c. A monopolistically competitive firm produces where MR = MC and thus does not have a supply curve.

6.

a. Q = 3 units; P = $70.

b. Q = 4 units; P = $60.

c. $DWL = \frac{1}{2}(\$70 - \$40)(1) = \$15.$

7.

a. The inverse linear demand function is P = 10 – .5Q.

b. MR = 10 – Q and MC = –14 + 2Q. Setting MR = MC yields 10 – Q = –14 + 2Q. Solving for Q yields Q = 8 units. The optimal price is P = 10 – .5(8) = $6.

c. Revenues are R = ($6)(8) = $48. Costs are C = 104 – 14(8) + $(8)^2$ = $56. Thus the firm earns a loss of $8. However, the firm should continue operating since it is covering variable costs.

d. In the long run exit will occur and the demand for this firm's product will increase until it earns zero economic profits. Otherwise, the firm should exit the business in the long run.

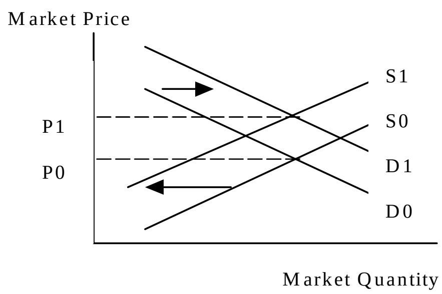
8.

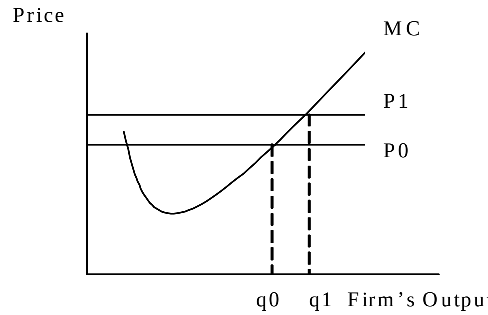
a. The optimal advertising to sales ratio is given by $\frac{A}{R} = \frac{E_{Q,A}}{-E_{Q,P}} = \frac{0.1}{2} = 0.05$.

b. $\frac{A}{R} = \frac{E_{Q,A}}{-E_{Q,P}} \Rightarrow \frac{A}{\$50,000} = \frac{0.1}{2} \Rightarrow A = (.05)(\$50,000) = \$2,500$.

9. Chastise the manager. Profit maximization requires producing where MR = MC.

10. Since you are a perfectly competitive firm, the price you charge is determined in a competitive market. The two events summarized will result in a decrease in market supply and an increase in the market demand, resulting in a higher market price (from P0 to P1 in the graphs below). Your profit-maximizing response to this higher price is to increase output. This is because we are a price taker (hence P = MR = the demand for our product) and the increase in price from P0 to P1 means that MR > MC at our old output. It is profitable to increase output from q0 to q1, as shown below.





11. It competes in a monopolistically competitive market. Short run profits may be earned by introducing new products more quickly than rivals. Over time, other firms will innovate too so in the long run Pizza Hut earns zero economic profits.

12. Profit maximization requires equating MR and MC. Since $MR = P\left(\frac{1+E}{E}\right) = \$1.25\left(\frac{1-2.5}{-2.5}\right) = \$0.75$ and MC = \$0.25, MR > MC. This means your firm can increase profits by reducing price in order to sell more pills.

13. Notice that MR = 1,000 – 10Q, $MC_1 = 10Q_1$ and $MC_2 = 4Q_2$. In order to maximize profits (or minimize its losses), the firm equates MR = MC_1 and MR =MC_2. Since Q = $Q_1 + Q_2$, this gives us

$$\begin{aligned} 1000 - 10(Q_1 + Q_2) &= 10Q_1 \\ 1000 - 10(Q_1 + Q_2) &= 4Q_2 \end{aligned}.$$

Solving yields $Q_1 = \frac{200}{9} \approx 22.22$ units and $Q_2 = \frac{500}{9} \approx 55.56$ units. The optimal price is the amount consumers will pay for the $Q_1 + Q_2 = \frac{200}{9} + \frac{500}{9} = \frac{700}{9} \approx 77.78$ units, and is determined by the inverse demand curve: $P = 1,000 - 5\left(\frac{700}{9}\right) = \frac{\$5,500}{9} \approx \$611.11$. At this price and output, revenues are R = (\$611.11)(77.78) = \$47,532.14, while costs are $C_1 + C_2 = \left(10,050 + 5(22.22)^2\right) + \left(5,000 + 2(55.56)^2\right) = \$23,692.47$. The firm thus earns profits of \$23,839.67.

14. College Computers is a monopolistically competitive firm and faces a downward sloping demand for its product. Thus, you should equate MR = MC to maximize profits. Here, MR = 1000 – 2Q and MC = 2Q. Setting 1000 – 2Q = 2Q implies that your optimal output is 250 units per week. Your optimal price is P = 1000 – 250 = $750. Your weekly revenues are R = ($750)(250) = $187,500 and your weekly costs are C = 2000 + $(250)^2$ = $64,500. Your weekly profits are thus $123,000. You should expect other firms to enter the market; your profits will decline over time and you will lose market share to other firms.

15. Your average variable cost of producing the 10,000 units is $600 (depreciation is a fixed cost). Since the price you have been offered ($650) exceeds your average variable cost ($600), you should accept the offer; doing so adds $50 per unit (for a total of $500,000) to your firm's bottom line.

16. Note first that overhead costs are irrelevant, as they are a fixed cost. Second, the explicit (accounting) MC is $2.75. Third, we must consider opportunity cost: By producing Type A bolts we lose the opportunity to produce type B bolts. Since each Type B bolt produced would net $4.75 - $2.75 = $2, the implicit MC is $2. Thus, the relevant MC is the sum of these explicit and implicit costs, or $2.75 + $2 = $4.75. To determine the profit-maximizing level of Type A bolts to produce, we must compare MR and MC. Given the marketing data, we can compute the MR as shown in the accompanying table. As shown in the table, MR > MC up to 3 units, so to maximize profits the firm should produce 3 units of Type A bolts.

Quantity	Price	***TR***	***MR***	***MC***
0	10	***0***	**-**	***4.75***
1	9	***9***	***9***	***4.75***
2	8	***16***	***7***	***4.75***
3	7	***21***	***5***	***4.75***
4	6	***24***	***3***	***4.75***
5	5	***25***	***1***	***4.75***

17. $\frac{A}{R} = \frac{E_{Q,A}}{-E_{Q,P}} \Rightarrow .065 = \frac{E_{Q,A}}{4.5} \Rightarrow E_{Q,A} = (.065)(4.5) = 0.2925$. Thus, Gillette's advertising elasticity is approximately 0.29. Gillette's demand is less responsive to advertising than its rivals; their higher advertising-to-sales ratio imply a greater advertising elasticity.

18. When the per-ton price of scrap steel is \$156, market equilibrium is reached when $P = \$260$ per ton and $Q = 6200$ tons. When the per-ton price of scrap steel is \$302, market equilibrium is reached when $P = \$580$ per ton and $Q = 3000$ tons. As the market price rises, the equilibrium market quantity falls. Competition implies that at an equilibrium market price of \$260 per ton each representative minimill produces $Q = 13$ tons $(P = MC)$. As the equilibrium market price increases, the amount produced by each representative firm increases to $Q = 29$ tons. As the equilibrium market price rises, each representative firm supplies more to the market. The higher price of scrap steel causes some firms to drop out of the market. Therefore, each representative minimill that remains in the market can produce more output.

19. When the two companies are permitted to maximize profit, the equilibrium price in each market will be €0.68 and produce 575 kilowatts per hour $(MR = MC \Leftrightarrow 1.255 - 0.002Q = 0.105)$. Thus, the price elasticity of demand at the profit-maximizing price-quantity combination is $\varepsilon = -\frac{1}{.001}\left(\frac{0.68}{575}\right) = -1.18$. This price elasticity of demand makes sense because a monopolist with linear demand will never maximize profit on the inelastic portion of the demand function. Prior to privatization the price-quantity combination was P = €0.105 and $Q = 1150$ and profits are – €100.625 in each market. The state-owned facility is losing its fixed costs. Privatization will increase the price and reduce the amount of electricity generated in each market: P = €0.68 and $Q = 575$. Each firm will earn €230. Thus, each firm will earn €330.625 more in each market as a result of privatization; since €230 – (– €100.625) = €330.625.