Answer key – Problem Set 3

Chapter 7

2.

a. The HHI is

$$HHI = 10{,}000\left[\left(\frac{\$200{,}000}{\$1{,}100{,}000}\right)^2 + \left(\frac{\$400{,}000}{\$1{,}100{,}000}\right)^2 + \left(\frac{\$500{,}000}{\$1{,}100{,}000}\right)^2\right] = 3{,}719 .$$

b. The four-firm concentration ratio is 100 percent.

c. If the firms with sales of $200,000 and $400,000 were allowed to merge, the resulting HHI would increase by 1,322 to 5,041. Since the pre-merger HHI exceeds that under the *Guidelines* (1,800) and the HHI increases by more than that permitted under the *Guidelines* (100), the merger is likely to be challenged.

3. The elasticity of demand for a representative firm in the industry is –1.5, since

$$0.6 = \frac{-0.9}{E_F} \Rightarrow E_F = \frac{-0.9}{0.6} = -1.5..$$

4.

a. $100. To see this, solve the Lerner index formula for *P* to obtain

$$P = \left(\frac{1}{1-L}\right)MC = \left(\frac{1}{1-0.65}\right)\$35 = \$100 .$$

b. Since $P = \left(\frac{1}{1-L}\right)MC$, it follows that the markup factor is $\left(\frac{1}{1-0.65}\right) = 2.86$.

That is, the price charged by the firm is 2.86 times the marginal cost of producing the product.

c. The above calculations suggest price competition is not very rigorous and that the firm enjoys market power.

17. See Table 7-1.

	Own Price Elasticity of Market Demand	Own Price Elasticity of Demand for Representative Firm's Product	Rothschild Index
Agriculture	-1.8	-96.2	0.019
Construction	-1.0	-5.2	0.192
Durable manufacturing	-1.4	-3.5	0.400
Nondurable manufacturing	-1.3	-3.4	0.382
Transportation	-1.0	-1.9	0.526
Communication and utilities	-1.2	-1.8	0.667
Wholesale trade	-1.5	-1.6	0.938
Retail trade	-1.2	-1.8	0.667
Finance	-0.1	-5.5	0.018
Services	-1.2	-26.4	0.045

Table 7-1

Based on the Rothschild indices in Table 7-1, wholesale trade most closely resembles a monopoly, while finance most closely resembles perfect competition.

Chapter 8

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.

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.

17. 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.

Chapter 9

2.

a. $Q_1 = \frac{a - c_1}{2b} - \frac{1}{2}Q_2 = \frac{100-12}{2(2)} - \frac{1}{2}Q_2 = 22 - 0.5Q_2$ and

$Q_2 = \frac{a - c_2}{2b} - \frac{1}{2}Q_1 = \frac{100-20}{2(2)} - \frac{1}{2}Q_1 = 20 - 0.5Q_1$.

b. $Q_1 = 16$; $Q_2 = 12$.
c. P = 100 – 2(28) = $44.
d. Π_1 = $512; Π_2 = $288.

4.

a. $Q_F = \frac{a - c_F}{2b} - \frac{1}{2}Q_L = \frac{20,000 - 4,000}{2(5)} - \frac{1}{2}Q_L = 1,600 - 0.5Q_L$.

b. $Q_L = 1800$; $Q_F = 700$.

c. P = 20,000 – 5(2500) = $7,500.

d. Π_L = $8.1 million; Π_F = $2.45 million.

5.

a. Set P = MC to get 500 – 2Q = $100. Solving yields Q = 200 units.

b. P = MC = $100.

c. Each firm earns zero economic profits.

Part 2.

Problem 1.

- See page 241-243 of the textbook.

1.1 Problem 2

Marginal revenues $MR = 100 - 2Q$

Marginal cost San Jose $MC_{SJ} = 4q_{sj}$

Marginal cost Santa Cruz $MC_{SC} = 6q_{sc}$

We know that a sufficient condition to produce in both plants is $MR = MC_{SJ} = MC_{SC}$

working out the algebra, we get $q_{sj} = 3/2q_{sc}$ and

$$\begin{aligned}
100 - 2q_{sj} - 2q_{sc} &= 6q_{sc} \\
100 - 3q_{sc} - 2q_{sc} &= 6q_{sc} \\
100/11 &= q_{sc}
\end{aligned}$$

Therefore, $q_{sj} = 150/11$

For completeness we need to check if joint profits is higher than profits producing using one plant.

$\pi_{BOTH} = 100 - 500/11 - 100 - 2 * (150/11)^2 - 3(100/11)^2$

Notice that $q^1_{SJ} = 100/6$ and $q^1_{SC} = 100/8$

$\pi_{SJ} = 100 - 200/6 - 75 - 2 * (100/6)^2$

$\pi_{SC} = 100 - 200/8 - 25 - 3 * (100/8)^2$

comparing profits, we can check that it is optimal to produce ONLY in Santa Cruz!

1.2 Problem 3 - from the game in class

let's work out a general case and then use the variables given in the problem set,

assume a linear inverse demand $P = A - b(\sum_{i=1}^{N} q_i) = A - bQ$ and a liner cost function $C_i = cq_i$

where q_i represents the quantity produced by firm i,N is the total number of firms in the market and Q the total quantity produced in the market.

the profits for the firm j is given by

$$\pi_j = Pq_j - cq_j$$

the FOC is

$$A - b(\sum_{i=1}^{N} q_i) - bq_j - c = 0$$

then adding the FOC for each firm in the market

$$N \cdot A - N \cdot b \cdot Q - bQ - Nc = 0$$

then solving for Q

$$Q = \frac{N(A-c)}{b(N+1)}$$

Now, let's check the parameters given in the problem set. We know that $A = 100$, $N = 4$, $c = 4$, $b = 1$

therefore, the total quantity in the market is $Q = \frac{4*96}{5}$ then each firm produces $q_i = 96/5 \approx 19$

Note: Notice that game in class, groups are choosing quantities simultaneously. Therefore, the appropiate model to study the game played is the COURNOT model. Cournot was one of the pioneers in micro-theory.