

FE341: Microeconomics  
Homework 5  
Due November 15<sup>th</sup>

1. From the textbook page 378: Chapter 10 Questions for Review #1

**When marginal cost is greater than marginal revenue, the incremental cost of the last unit produced is greater than incremental revenue. The firm would increase its profit by not producing the last unit. It should continue to reduce production, thereby decreasing marginal cost and increasing marginal revenue, until marginal cost is equal to marginal revenue.**

2. From the textbook page 378: Chapter 10 Exercises #2

**As a larger producer of farm equipment, Caterpillar Tractor has market power and should consider the entire demand curve when choosing prices for its products. As their advisor, you should focus on the determination of the elasticity of demand for each product. There are three important factors to be considered. First, how similar are the products offered by Caterpillar's competitors? If they are close substitutes, a small increase in price could induce customers to switch to the competition. Secondly, what is the age of the existing stock of tractors? With an older population of tractors, a 5% price increase induces a smaller drop in demand. Finally, because farm tractors are a capital input in agricultural production, what is the expected profitability of the agricultural sector? If farm incomes are expected to fall, an increase in tractor prices induces a greater decline in demand than one would estimate with information on only past sales and prices.**

3. From the textbook page 378: Chapter 10 Exercises #3

$$\frac{(P - MC)}{P} = -1/E_D \Rightarrow \text{optimal price initially is } \frac{(P - 20)}{P} = \frac{1}{2}$$

Solving this for P:  $2P - 40 = P$  or  $P = \$40$ .

When MC rises by 25%, MC is equal to 25. Therefore, the new optimal price is

$$\frac{(P - MC)}{P} = -1/E_D \Rightarrow \text{optimal price initially is } \frac{(P - 25)}{P} = \frac{1}{2}$$

Solving this for P:  $2P - 50 = P$  or  $P = \$50$ , which is a 25% increase in price. So the answer is YES, increase price by 25%.

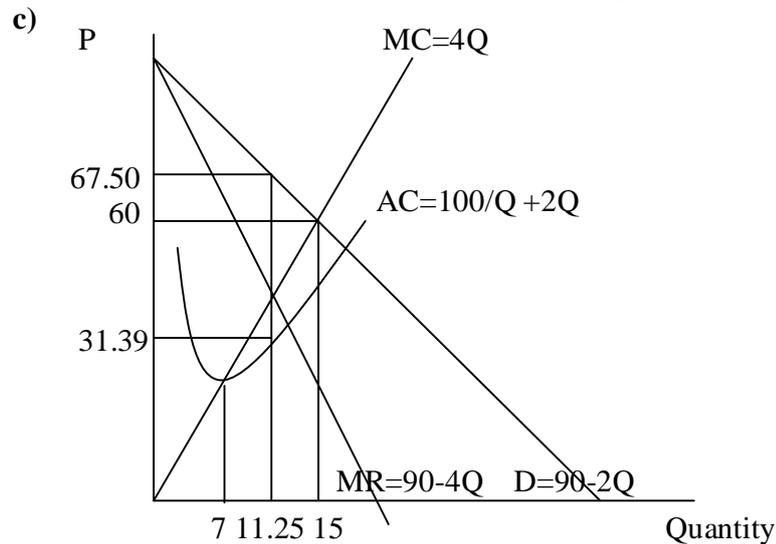
4. From the textbook page 378: Chapter 10 Exercises #5

- a) From the given information, the inverse demand curve is given by  $P = 18 - \frac{1}{2}Q$ . Therefore,  $TR = P \cdot Q = (18 - \frac{1}{2}Q)Q$ , so  $MR = dTR/dQ = 18 - Q$ .
- b) The profit maximizing output is where  $MC = MR$ , because  $MC = 10$  we need to set  $MC = 10 = 18 - Q = MR \Rightarrow Q = 8$ . The profit maximizing price is found by substituting this into  $P = 18 - \frac{1}{2}(8) = 14$ . Therefore, total revenue is  $P \cdot Q = 14 \cdot 8 = 112$ . Because  $FC = 0$ , and  $MC = 10$ , our total cost are equal to  $TC = 10Q$ , which means profits are given by  $TR - TC = 112 - 80 = 32$ .

- c) For a perfectly competitive industry, price is equal to MC. Therefore,  $MC = 10 = 18 - \frac{1}{2}Q = P \Rightarrow Q = 16$  and  $P = 10$
- d) The social gain arises from eliminating the deadweight loss. The deadweight loss is the triangle above the constant MC, below demand, between quantities 8 and 16. Therefore,  $DWL = (14 - 10)(16 - 8) * \frac{1}{2} = \$16$ . Consumers gain this DWL plus the monopolist's profit of \$32. Profits are reduced to 0 and consumer surplus increases to \$48.

5. From the textbook page 378: Chapter 10 Exercises #6

- a) If there is only one firm in the industry, then the firm will act as a monopolist and produce where  $MR = MC \Rightarrow MC = 4Q = 90 - 4Q = MR$ , so  $Q = 11.25$ . The corresponding price is  $P = 90 - 2*(11.25) = \$67.50$ . Profits are  $TR - TC = \$406.25$ .
- b) If the industry is perfectly competitive, then  $P = MC$ , so  $P = 90 - 2Q = 4Q = MC \Rightarrow Q = 15$ . The corresponding price is  $P = 90 - 2*(15) = \$60$  (also could say  $MC = P = 4*15 = 60$ ). The profit is \$350.



$AC = 100/Q + 2Q$ , so at  $Q = 11.25$ ,  $AC = 31.39$

The profit that is lost by having the firm produce the competitive level ( $q=15$ ) rather than the monopoly level ( $q=11.25$ ) is the difference in the two profits calculated above.