

## Problem set 3

due 3/3/11

1. Suppose a chair manufacturer is producing in the short run (with its existing plant and equipment). The manufacturer has observed the following levels of production corresponding to different numbers of workers:

number of workers	number of chairs
1	10
2	18
3	24
4	28
5	30
6	28
7	25

a. Calculate the marginal and average product of labor for this production function. (hint: average product of labor is simple: how much, on average, each worker is producing, for every possible number of workers you can hire).

b. Does the production function exhibit diminishing returns to labor?

c. Explain intuitively what might cause the marginal product of labor to become negative.

2. Suppose you are the manager of a watchmaking firm operating in a competitive market. Your cost of production is given by  $C = 200 + 2q^2$ , where  $q$  is the level of output and  $C$  is total cost. (The marginal cost of production is  $4q$ ; the fixed cost is \$200.)

a. If the price of watches is \$100, how many watches should you produce to maximize profit?

b. What will the profit level be?

c. What is the smallest the price can be for the firm to produce in the short-run? In the long-run?

3. A competitive firm has the following short-run cost function:  $C(q) = q^3 - 8q^2 + 30q + 5$ .

a. Find  $MC$ ,  $AC$ , and  $AVC$ , and sketch them on a graph (hint:  $MC = 3q^2 - 16q + 30$ .)

b. At what range of prices will the firm supply zero output, in the short-run?

c. Identify the firm's supply curve on your graph.

d. At what price would the firm supply exactly 6 units of output?

4. Suppose that you are given the following information about a particular industry:

$$Q^D = 6500 - 100P \quad \text{Market demand}$$

$$Q^S = 1200P \quad \text{Market supply}$$

$$C(q) = 722 + \frac{q^2}{200} \quad \text{Each firm's total cost function}$$

$$MC(q) = \frac{2q}{200} \quad \text{Each firm's marginal cost function} \tag{1}$$

- a.** Find the equilibrium price, the equilibrium quantity, the output supplied by the firm, and the profit of each firm.
- b.** Would you expect to see entry or exit from this industry in the long run? Explain. What effect will entry or exit have on market equilibrium?
- c.** What is the lowest price at which each firm would sell its output in the long run? Is profit positive, negative, or zero at this price? Explain.
- d.** What is the lowest price at which each firm would sell its output in the short run? Is profit positive, negative, or zero at this price? Explain.