Short Questions
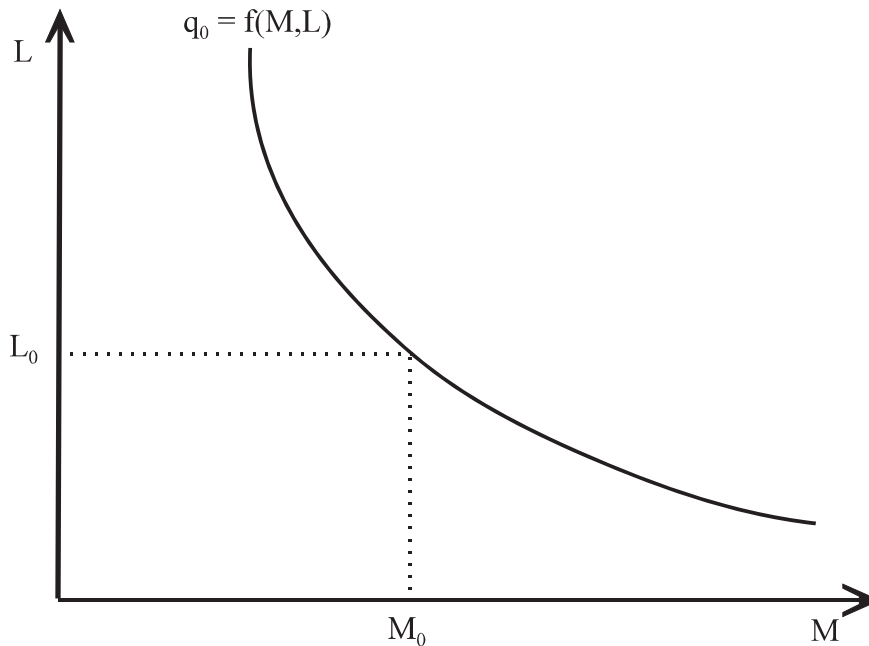
1. A firm is currently producing output q_0 using L_0 units of labor and M_0 units of other materials. The isoquant that corresponds to output level q_0 and the firm's optimal input choices are given in the figure below.


A. In the above graph, draw with a solid line the isocost that corresponds to the lowest cost of producing output q_0. [Hint: think of what must be the least cost isocost if L_0 and M_0 are the optimal input choices.]

B. Suppose the price of materials goes down. In the above graph, indicate what would be the new optimal choice of L and M, if the firm were to continue producing q_0 units of output. Label the new levels of L and M by L_1 and M_1. Also draw the corresponding isocost using a dashed line.

C. After the decrease in the price of materials, the firm finds it optimal to change its output from q_0 to q_2. In the above graph, draw the isoquant that corresponds to the new output level.

2. Two cement companies, A and B, operate in two geographically distinct markets. [Cement is not easily transportable, so that two markets can be considered as being totally isolated.] The demand and marginal revenue functions for the two firms are given below. [Marginal revenue functions are with dashed lines.]
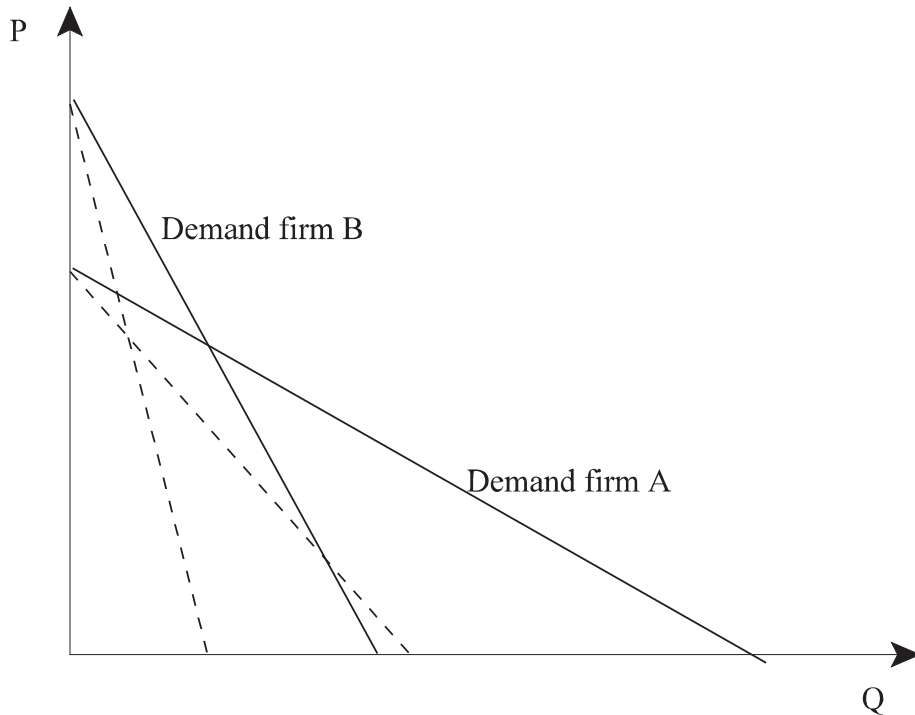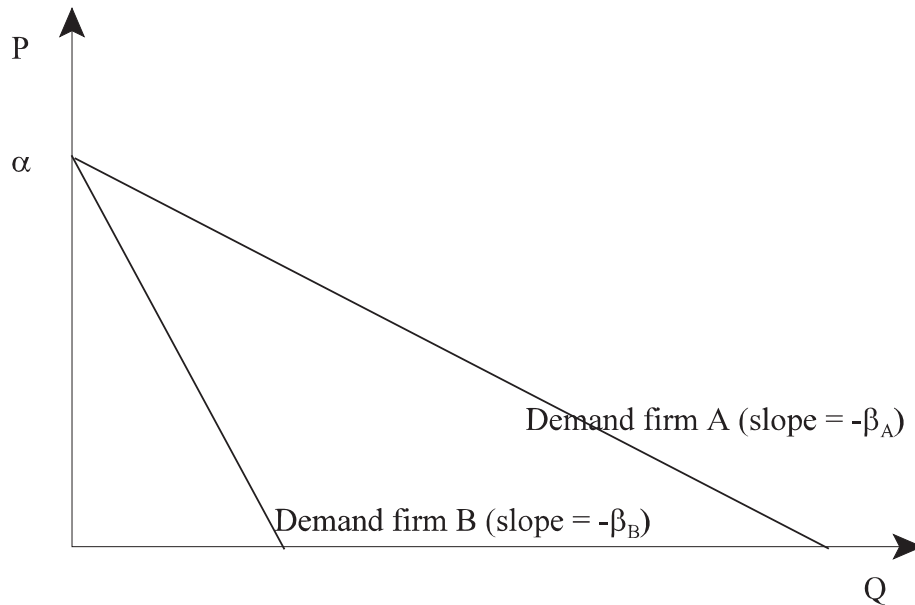

The marginal cost of production is constant, that is, it does not depend on output, and is the <u>same</u> for the two firms. Consider the following statements:

i.   The profit maximizing output of firm B is smaller than the profit maximizing output of firm A.

ii. If the profit maximizing output of firm A and firm B is the same, then firm A will charge a higher price than firm B.

iii. If the two firms are observed to charge the same price, then at least one of them is not maximizing profits.

iv. If the marginal cost goes up for both firms (by an equal amount), then the output of firm B will be reduced by less than the output of firm A.

Indicate which of these statements are known to be true given the information above.

3. Two cement companies, A and B, operate in two geographically distinct markets. [Cement is not easily transportable, so that two markets can be considered as being totally isolated.] The demand functions for the two firms are shown below. [The demand functions are linear, have the same intercept but different slopes.]
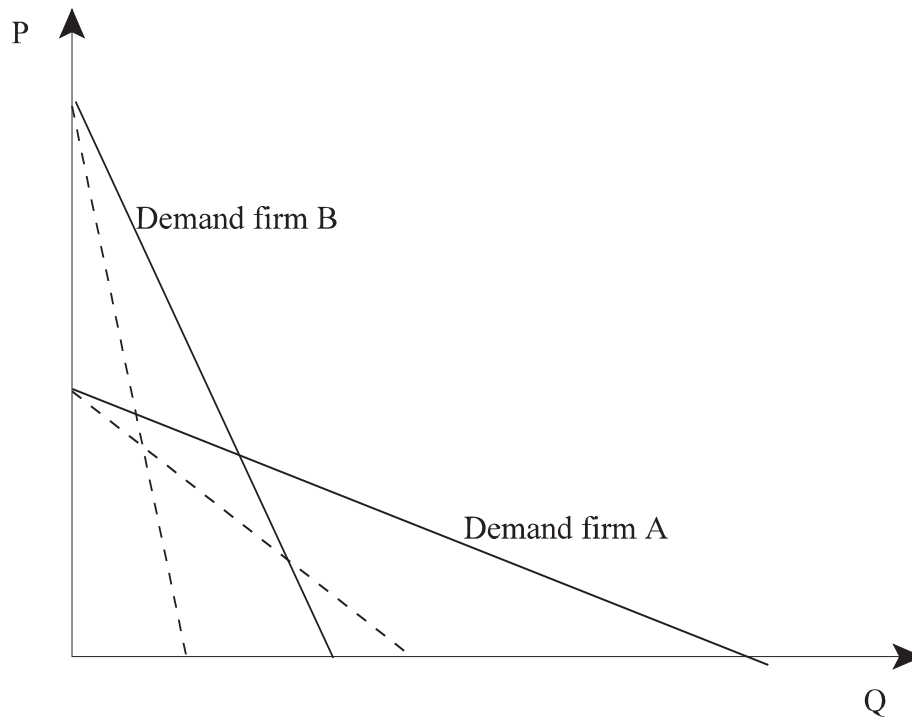

For both firms, the marginal cost of production is constant, that is, it does not depend on output. However, the marginal cost of firm B is <u>higher</u> than that of firm A.

Consider the following statements:

i. Firm B will charge a higher price than firm A.

ii. Firm B will produce less output than firm A.

iii. If the marginal cost of firm A were to increase to the same level as that of firm B, the two firms would charge the same price.

iv. If the marginal cost of firm A were to increase to the same level as that of firm B, the two firms would produce the same level of output.

Indicate which of the above statements are true. [Some algebra is needed to determine the answer to these questions.]

4. Two cement companies, A and B, operate in two geographically distinct markets. [Cement is not easily transportable, so that two markets can be considered as being totally isolated.] The demand and marginal revenue functions for the two firms are given below. [Marginal revenue functions are with dashed lines.]

P

Demand firm B

Demand firm A

Q

The marginal cost of production is constant, that is, it does not depend on output, it is the <u>same</u> for the two firms, and equal to c. Consider the following statements:

i.   Suppose $c=0$. Then, the profit maximizing output of firm B is the same as the profit maximizing output of firm A.

ii. Suppose $c>0$. If the profit maximizing output of firm A and firm B is the same, then firm A will charge a lower price than firm B.

iii. Regardless of what the value of c is, firm B will charge a higher price than firm A.

iv. If the marginal cost goes down for both firms (by an equal amount), then the output of firm B will be increased by less than the output of firm A.

v.   Suppose that $c>0$. Now, suppose that the marginal cost of firm B drops to zero, while that of firm A stays at c. Then, the price of firm B may drop below the price of firm A.

Indicate which of these statements are known to be true given the information above.

Problems

1. A firm producing hockey sticks has a production function given by:

$$q = 2 \sqrt{K L}$$

In the short run, the firm's amount of capital equipment is fixed at $K = 100$. The cost of capital is $r = \$2$, and the wage rate for L is $w = \$2$.

a. What is the firm's short-run demand for labor as a function of output produced ?

b. Calculate the firm's short-run total cost curve.

c. Calculate the short-run average cost curve.

d. What is the firm's short-run marginal cost function ?

e. Which output level minimizes the short-run average cost ? [The answer should be a number.]

f. What would be the firm's profit maximizing choice of output if output price is equal to 5 ? How much labor would the firm hire ?

2. A firm has production function:

$$Q = K^{0.3} L^{0.5}$$

a. What is the marginal product of labor ? What is the marginal product of capital?

b. If the cost of labor is 2 and the cost of capital is 3, in what proportion should the firm employ capital and labor in order to minimize the cost of producing a given amount of output? [That is, how much capital will the firm hire in terms of the amount of labor hired?]

c. How much labor and capital will the firm hire in order to produce output q in the lowest possible cost?

d. What is this firm's cost function? [i.e. the lowest possible cost of producing output q.]

e. What is this firm's marginal cost?

f. What is this firm's average cost?

h. How much output will this firm produce if the market price is equal to P?

i. How much labor will this firm hire as a function of the market price?

3. Suppose a firm has a production process that is given by the equation $q = 2G + 3E$ where G is the amount of natural gas used and E is the amount of electricity used. Let the price of electricity be equal to 4 and the price of natural gas 3. The firm is facing a demand given by $P = \alpha - q$.

a. How much electricity and how much natural gas should the firm use to produce 12 units of output at lowest cost?

b. In general, how much electricity and how much natural gas should the firm use to produce q units of output at lowest cost?

c. What is this firm's cost function?

d. How many units of electricity and how many units of natural gas would the firm demand to produce the profit maximizing level of output? How are they affected by an increase in the demand for the product? (i.e., by an increase in the α?)