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Problem Set 6

Key concepts:

- factor of production
- fixed cost
- variable cost
- total cost
- marginal cost
- average cost

1. Let the total cost of a firm be described by

$$TC(q) = 10q^2 + 1000$$

where q denotes the size of production.

   (a) Identify which part is the variable cost and which is the fixed cost.

   (b) Calculate the average and marginal cost for each level of production and draw the respective curves

2. The technical department of a company estimated the following function of production:

$$Q = 10KL.$$

Knowing that the prices of the factors are $w = 10$ and $r = 4$

   (a) Calculate the expression for the total cost curve.

   (b) Calculate the expressions for the AC (average cost) and MC (marginal cost).

   (c) Using the results of (b), determine whether there are returns to scale in this production process.

3. Consider a company having the following production function:

$$Q = 2K^{1/2}L^{1/2}.$$

The price of capital is €4 and the price of labor is €9.

   (a) The entrepreneur has the goal to produce 100 units of the good. Knowing that she acts rationally, what are the amounts of the factors to use? What budget is necessary?

   (b) Assume that the available budget is €504. What is the production plan (i.e., optimal Q, L, and K) compatible with this budget?

(c) The entrepreneur has planned and produced in accordance with (b). Previously, he was able to obtain financing to produce 100 units of output: under the condition of short run production. Determine the quantities used in this production, if K cannot be altered. Compare this situation to the long–run production.

(d) If a price of capital increases to $r = 5$, what is the budget necessary to sustain the level of production found in (b). Comment on the effect of the price change on the quantities of factors of production used.

4. The short–run total costs function is:

$$TC = Q^3 - 4Q^2 + 20Q + 6$$

(a) Determine the expressions for the variable costs, fixed costs, average variable cost, average fixed cost, average cost and marginal cost.

(b) Why is common for managers to say that producing greater amounts of output brings down unitary costs?

5. Explain the relations among AVC, MC, AP and MP

6. Company "Orchid" plans to open a new florist shop in a commercial center. There are three premises available for rent, which differ in the area (A): 50 m^2, 100 m^2 and 200 m^2. Monthly rent is equal 100 Euro/m^2. Other costs of production depend on the number of flowers sold and are equal to $VC = q^2/A$.

(a) Write down the expressions for the average costs and the marginal costs for each possible shop.

(b) Represent graphically the cost curves.

(c) Indicate on the graph the marginal cost and average cost curves in the long run. Explain, how this information can be used by "Orchid" to decide on which shop to rent.

7. A firm purchases capital and labor in competitive markets at prices of $r = 6$ and $w = 4$, respectively. With the firm's current input mix, the marginal product of capital is 12 and the marginal product of labor is 18. Is this firm minimizing its costs? If so, explain how you know it. If not, explain what the firm ought to do.