

Microeconomics

Fall 2011

Class #3: Cost Minimization. Perfect Competition.

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Classes: 40, 41

Question 1

Consider a firm operating in a perfectly competitive market, with technology summarized by the production function $y = \sqrt[3]{LK}$, where y , L and K stand for the quantities of output, labor and capital, respectively. Denote by p the price of output, by w the cost of each unit of labor and by r the cost of each unit of capital.

(i) Suppose that in the short-run $K = 9$. Obtain the expressions for the firm's variable costs and fixed costs.

(ii) Assume now that $p = 3$, $w = r = 1$. Formalize and solve the profit maximization problem for this firm in the short-run. Determine the quantity of output, y , that will be produced, as well as the quantities of L and K that will be used.

(iii) Obtain the long-run cost function for this firm as function of (w, r, y) . Plot in one graph both the short-run and long-run cost functions.

(iv) Determine the output level, y , that maximizes the firm's profit, assuming that it is able to choose the quantities of both factors freely and that $p = 3$, $w = r = 1$. What quantities of L and K will the firm choose?

Question 2

Consider the short-run total cost function of a firm that can be described by $C = \frac{1}{2}q^2 + 3q + \frac{1}{2}$. This firm operates in a perfectly competitive market. The demand function is defined by $P = 7 - \frac{1}{5}Q$ and there are 5 firms operating in this market.

(i) Formalize the firm's problem and find its supply curve.

(ii) Characterize the short-run equilibrium (price, individual quantity, total quantity and profits).

(iii) Suppose that in the long-run the firm can choose between two levels of capital, K_1 and K_2 such that $C_1 = \frac{1}{2}q^2 + 3q + \frac{1}{2}$ if $K = K_1$ and $C_2 = \frac{1}{2}q^2 + \frac{1}{3}q + \frac{9}{2}$ if $K = K_2$. Compute the average total cost in the long-run and the long-run free entry equilibrium (price, individual quantity, total quantity and the number of firms operating in the market).