

ECO 300 – MICROECONOMIC THEORY – FALL 2005
QUESTIONS FOR PRECEPTS WEEK 5 – OCTOBER 19

QUESTION 1:

A firm's production function is $Q = (3/2) (K^{2/3} + L^{2/3})$, where Q is the quantity of output, and K, L are the inputs of capital and labor respectively. The cost of each unit of capital is r and that of each unit of labor is w . The firm wants to minimize its total cost $C = rK + wL$, of producing an assigned or given quantity Q . Solve this problem, and show that the resulting cost, expressed as a function of Q, w , and r , is

$$C = (2/3)^{3/2} Q^{3/2} (r^{-2} + w^{-2})^{-1/2}$$

Does the production function have increasing or diminishing returns to scale? Is the average cost increasing or decreasing?

QUESTION 2:

Witches' Brew beer is brewed in cylindrical tanks. A tank that will produce the volume of beer equal to V per year costs $kV^{2/3}$ to buy, and lasts four years. The tanks are specialized to this use and have no alternative uses. Ignore interest, and assume that the cost of a tank is amortized or depreciated linearly over its life.

Each tank requires one person to operate it; the firm has to write a contract to hire this worker for one year and the salary is w per year. The costs of selling a quantity Q of beer during the year is cQ^2 .

(a) Suggest intuitive reasons for these forms of the costs.

Suppose the firm made had plans to produce the quantity 8 each year, and therefore had purchased and installed a tank with volume $V = 8$. Now look at the situation at the beginning of any one year, say the third, during the life of this tank. The firm gets a new estimate of the demand prospects from this point onward, and decides to produce Q , which may be less than or more than 8.

(b) Write down the expressions for the total cost of this firm for this year's production as a function of Q . Identify which costs are fixed, which are sunk, which are variable, and which are avoidable.

(c) Write down the expressions for the marginal cost, average cost, average variable cost, and average avoidable cost as functions of Q .