

KANSAS STATE UNIVERSITY
Economic Analysis For Business

Problem Set 2
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Economics 815
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1. Let the firm's production function be given by $Q = 4K^{0.5}L^{0.5}$, where K is capital and L is labor. The price of capital and labor per unit are given respectively by $r = 2$ and $w = 2$.
 - a) Determine the efficient combination of K and L the firm would employ to produce 32 units of output. [Note: You are not required to use Calculus to solve this problem.]
 - b) Determine whether this production function reflects decreasing, constant, or increasing returns to scale.
2. You have been retained as a consultant for a firm that must select a long-lived production technology. The firm has narrowed its selection to the following choices. $Q = \min \{K, 1/2L\}$ and $Q = 1/2K + 1/4L$. Each production technology requires the same up-front investment. Current input prices are $r = 2$ and $w = 1$.
 - a) What is the cost function associated with each of the technologies at current input prices?
 - b) What recommendation would you make to this firm concerning its choice of technology? Provide an economic rationale for your answer.
3. A firm can produce each unit of output using either $1/2$ unit of capital (K) or 1 unit of labor (L). Write down the production function that reflects these properties. Does this production reflect increasing, decreasing, or constant returns to scale? Under what conditions would this firm use only capital in the production of its output? [Assume that firm's objective is to minimize the cost of producing any given level of output.]
4. The production function for a particular industry is given by $Q = n \min\{K, L\}$, where K is capital, L is labor and the positive integer n is the number of firms participating in the market.
 - a) Derive an expression for the cost function for this industry, where r is the price of capital per unit and w is the price of labor per unit.
 - b) Would the Department of Justice be likely to view favorably the prospective merger between two or more firms in this industry? Explain.

5. A profit-maximizing firm must make a choice in time period 1 as to the type of technology it will use in time period 2 to produce its output. The firm can make an up-front (sunk) investment of $I_A = 300$ in time period 1 to operate with the following production function in time period 2: $Q = 2K+L$. Alternatively, the firm can make an up-front (sunk) investment of $I_B = 400$ in time period 1 to operate with the following production function in time period 2: $Q = x \min \{2K, L\}$, where $x > 0$. [There are only 2 time periods in this model.]
- a) Suppose that $r = \$12$ and $w = \$2$. Derive the cost functions that prevail in time period 2 for each of the two production functions.
- b) The firm forecasts in time period 1 that it will produce 100 units of output in time period 2. For what values of x will the firm make the investment $I_B = 400$ and produce using the production function $Q = x \min \{2K, L\}$? What is the economic rationale for your solution?