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Department of Economics
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Intermediate Microeconomic Theory, ECO308

Problem Set 5 Covering Chapters 6, 7, 8

Due December 13th, 2011

Write your answers on a separate sheet and show all of your work in order to get full credit.

1. The production function at Ginko's Copy shop is $q = 1,000 \times \min(L, 3K)$ where q is the number of copies per hour, q , L is the number of workers and K is the number of copy machines. As an example, if $L = 2$ and $K = 1$, then $\min(L, 3K) = 2$ and $q = 2000$.
 - a. Draw the isoquants for this production function.
 - b. Draw the total product, average product, and marginal product of labor curves for this production function for some fixed level of capital.
2. Why might we expect the law of diminishing marginal product to hold?
3. Suppose the production function for widgets is given by

$$q = KL - .8K^2 - .2L^2$$

Where q represents the annual quantity of widgets produced, K represents annual capital input, and L represents annual labor input.

- a. Suppose $K = 10$; graph the total and average productivity of labor curves. At what level of labor input does this average productivity reach a maximum? How many widgets are produced at that point?
 - b. Again, assuming that $K = 10$, graph the MP_L (marginal productivity of labor) curve. At what level of labor input does $MP_L = 0$. Is the MP_L always diminishing as q increases?
 - c. Suppose capital inputs were increased to $K = 20$. How would your answers to part a and b change?
 - d. Does the widget production function exhibit constant, increasing, or decreasing returns to scale?
4. A firm's cost curve is $C(q) = F + 10q + 10q^2 + q^3$,
 - a. What is the fixed cost faced by the firm?
 - b. At what output level is the AC minimized?
 - c. At what output levels does the MC curve cross the AC and the AVC curves?
The MC curve crosses the AC and AVC curves at their minimum.
 5. What is the long-run cost function if the production function is $q = L + K$?
 6. A firm has a Cobb-Douglas production function, $q = L^{0.25}K^{0.75}$. Assume that the firm maximizes profit by producing 100 units of the good that they produce per week. Both a worker and a unit of capital cost \$1,000 per week. What is the least-cost input combination per week? What is the total cost?
 7. If the cost function for John's shoe repair is $C(q) = 100 + 10q - q^2 + 1/3q^3$, what is the firm's marginal cost function? What is its profit-maximizing condition?