Economics 500: Microeconomic Theory
State University of New York at Binghamton
Department of Economics
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Problem Set #6

1. Roy Dingbat is the manager of a hot dog stand that uses only labor and capital to produce hot dogs. The firm usually produces 1,000 hot dogs a day with 5 workers and 4 grills. One day a worker is absent but the stand still produces 1,000 hot dogs. What does this imply about the 1,000 hot dog isoquant? What does this imply about Roy's management skills?

2. Marjorie Cplus wrote the following answer on her micro examination: "Virtually every production function exhibits diminishing returns to scale because my professor said that all inputs have diminishing marginal productivities. So when all inputs are doubled, output must be less than double." How would you grade Marjorie's answer?

3. Digging clams by hand in Sunset Bay requires only labor input. The total number of clams obtained per hour (q) is given by

$$q = 100(L)^{1/2}$$

where L is labor input per hour.
   a. Graph the relationship between q and L.
   b. What is the average productivity of labor in Sunset Bay? Graph this relationship and show that AP_L diminishes for increases in labor input.
   c. Determine the marginal productivity of labor. Graph this relationship and show that $MP_L < AP_L$ for all values of L. Explain why this is so.

4. Suppose the production function for widgets is given by

$$q = KL - 0.8K^2 - 0.2L^2$$

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 curve. At what level of labor input does $MP_L = 0$?
   c. Does the widget production function exhibit constant, increasing or decreasing returns to scale?

5. Suppose that

$$q = L^a K^b,$$

where $0 < a < 1$, $0 < b < 1$, $a + b = 1$.
   a. Show that $MP_L > 0$, $MP_K > 0$, and that the second partials are negative.
   b. Show that the MRTS depends only on K/L, but not on the scale of production, and that the MRTS diminishes as L/K increases.