MIDTERM EXAMINATION III
Version 2

Intermediate Microeconomics
(ECON 520)

November 15, 2000 Professor D. Weisman

Instructions: There are two parts to this examination weighted 50 points each. Please write legibly and think carefully about your answers. You may find that graphical and/or mathematical analysis will assist you in answering some of these questions. Good Luck!

Part I. Multiple Choice (50 points). Please indicate your answers on the standardized answer sheet provided.

1. According to our in-class discussion, Ford Motor Company agreed to a liberal wage and benefits package with the United Autoworkers because of?
   a. economies of scale.
   b.* relatively greater use of robotics in production.
   c. economies of scope.
   d. diminishing returns to labor
   e. a. and c.

2. Which of the following production functions reflects increasing returns to scale and diminishing returns to capital and labor?
   a. $Q = 2KL$
   b. $Q = \min\{2K, L\}$
   c.* $Q = K^{0.6}L^{0.5}$.
   d. $Q = K^{1.2}L^{0.5}$.
   e. none of the above.

3. Which of the following statements is true regarding sunk costs?
   a. Sunk costs have zero opportunity costs.
   b. Sunk costs cannot be recouped once they are incurred.
   c. Sunk costs are irrelevant for making forward-looking decisions.
   d.* all of the above.

4. A firm that produces using a typical production function finds that at current levels of input utilization it is producing the desired level of output and $MP_K < MP_L$, but $r = w$. To minimize the cost of producing this level of output, the firm should
   a. increase capital utilization and decrease labor utilization.
   b. maintain current levels of capital and labor utilization.
   c.* increase labor utilization and decrease capital utilization.
   d. increase both capital and labor utilization.
   e. none of the above.

5. The firm's average total cost of producing 10 units of output is 20. The firm's fixed costs are equal to 100. It follows that the firm's average variable costs are equal to
   a. 12.
   b.* 10.
   c. 8.
   d. 4.
   e. none of the above.

6. Suppose that your grade on this examination is described by the production function $G = 1.2A^{0.5}E^{1}$, where G is your numerical score, A is ability, and E is effort measured in terms of hours studied. Suppose that A = 100. What is the marginal product of E for the eighth hour studied.
   a. 16.
   b.* 12.
   c. 10.
   d. 8.
   e. none of the above.

7. A firm's production function is given by Q = 2K + L, where K is capital and L is labor. Initially, $r = 2$ and $w = 1$. Suppose that *w* increases, *ceteris paribus*. Relative to the initial equilibrium,
   a. the total cost of production will increase.
   b.* the total cost of production will not change.
   c. more units of capital will be used in production.
   d. fewer units of labor will be used in production.

8. A firm is currently producing its output efficiently using both K and L. Suppose that the price of labor rises but the firm does not alter the amount of K and L used in production. Which one of the following production functions is the firm operating with?
   a. Q = K + L.
   b. Q = KL.
   c.* Q = min {K, L}
   d. $Q = K^{0.5}L^{0.8}$.
   e. none of the above.

9. According to our in-class discussion, downsizing among Fortune 500 corporations has not produced measurable gains in corporate profits due to
   a. diseconomies of scope.
   b. diseconomies of scale.
   c. diminishing returns to capital.
   d.* the exodus of a disproportionate share of high ability workers.
   e. none of above.

10. According to the law of diminishing returns
    a. the total product of an input will eventually be negative.
    b. the total product of an input will eventually decline.
    c. the marginal product of an input will eventually be negative.
    d* the marginal product of an input will eventually decline.
    e none of the above

11. A typical production function has isoquants that are
    a. right angled.
    b.* convex to the origin.
    c. linear.
    d. characterized by a constant MRTS.
    e. c. and d.

12. A firm's marginal product of labor is 4 and its marginal product of capital is 8. If the firm reduces its capital utilization by 2 units but does not want its output quantity to change, the firm should
    a. increase its use of labor by 8 units.
    b.* increase its use of labor by 4 units.
    c. maintain the same level of labor utilization.
    d. reduce its use of labor by 2 units.
    e. none of the above.

13. In a production process, all inputs are doubled, but output less than doubles. This means that the firm's long run average cost curve is
    a.* upward-sloping.
    b. downward-sloping.
    c. has a zero slope
    d. b. or c.
    e. none of the above.

14. A firm is operating in a range of production where the Law of Diminishing Returns has set in. The firm's total product when 6 units of labor is employed is 20. The marginal product of the 6th unit of labor is 4. The firm's total product when 7 units of labor is employed is
    a. less than 20.
    b.* greater than 20 but less than 24
    c. greater than 24.
    d. 24.
    e. none of the above.

15. A firm can produce each unit of output with either 2 units of capital or 1 unit of labor. Which production function reflects these properties?
    a. $Q = \min \{2K, 1L\}$.
    b. $Q = \min \{\frac{1}{2}K, 1L\}$.

c. $Q = 2K + 1L$
d.* $Q = \frac{1}{2}K + 1L$
e. $Q = K^2L^1$.

Part II. Problems (50 points). Answer both questions. Each question is worth 25 points. Show all of your work to receive partial credit. Please write legibly, be precise with your answers, and remember that economy of presentation is a desirable attribute.

1. Let the firm's production function be given by Q = min {2K, L}. Suppose that $r = 4$ and $w = 2$.

a) (8) How much K and L is employed in the efficient production of 20 units of output?

b) (5) What is the minimum cost of producing 20 units of output?

c) (5) Construct an isoquant map for this production function and clearly indicate the slope of the efficient production locus (EPL).

d) (6) Determine whether this production function reflects increasing, decreasing, or constant returns to scale? Suppose that w increases from 2 to 3. How would your answer to part a) change?

2. You have been retained as consultant for a firm that must select a long-lived production technology. The firm has narrowed its selection to the following: Q = 2 min {2K, L} and Q = 2K + lL. Each production technology requires the same up-front sunk investment. Current input prices are $r = 4$ and $w = 2$.

a) (18) Derive the cost functions associated with each of the technology choices? That is, for C(Q) = xQ, find x? Determine whether these cost functions reflect economies of scale.

b) (6) What recommendation would you make to this firm concerning its choice of technology? Provide an economic rationale for your recommendation.