

**Homework 5**  
**Econ 361**  
**Intermediate Microeconomic Analysis**  
**Spring 2012**  
**30 points**

1. (5 points) Do the following functions exhibit increasing, constant, or decreasing returns to scale? What happens to the marginal product of each individual factor as that factor is increased and the other factor held constant?

b.  $q = L + 2K$

c.  $q = L^{1/5} K^{1/2}$

a.  $q = L^{2/3} K^{2/3}$

d.  $q = 3K^{1/4} + 5L$

2. (5 points) Consider a production function given by  $q = L^{2/3} K^{2/3}$  (where  $L$  is labor and  $K$  is capital) and a total cost function given by  $TC = q^2$ . Under what conditions could these functions belong to the same firm? Explain.

3. (5 points) A firm's output is given by  $q = 10K^{1/2}L^{1/2}$ . Its capital,  $K$ , is fixed and equals 100 units per hour. The wage paid per worker-hour ( $w$  paid per unit  $L$ ) is \$15, and the cost per unit of capital per hour is \$50. If worker-hours  $L$  rise from 9 to 16, by how much will marginal cost rise?

4. (5 points) My cousin is considering opening a lawn mowing business. He hires you as a consultant, and asks you to help him think through how to structure his business.

a. What kind of production function is my cousin likely to have in this business? Explain the relationship between inputs and output.

b. Given this production function, how should my cousin go about choosing the number of workers (per hour) and the number of lawnmowers (per hour) that he should use? Explain.

5. (3 points) Assume a firm uses two inputs, labor and capital. If the marginal product of capital divided by the user cost of capital is less than the marginal product of labor divided by the wage, then to minimize costs should this firm use more labor and less capital?

6. (3 points) If for a firm total costs more than double as output doubles, then is the firm experiencing decreasing returns to scale?

7. (4 points) Find a real world firm that exhibits decreasing returns to scale, and one that exhibits increasing returns to scale. Provide the name of the firm and evidence that supports your designation of the firm as one with decreasing or increasing returns to scale. Cite your sources.