Department of Economics
Microeconomics, Spring 2010

Problem Set 6: Costs, Cost Minimization and Profit Maximization
DUE in Class on March 3 (Skreta Sections) or March 5 (Bowmaker and Collard-Wexler Sections)

Name + ID: ________________________________________________________________
TAS Name: ________________________________________________________________

Part I: Short Answer Questions

1. True or false, explain. When the firm’s production function exhibits decreasing returns to scale, the isocosts come closer together as we move away from the origin.

2. True or false, explain. The law of diminishing marginal returns implies that when the use of an input increases with the other input fixed, we will always end up with a negative marginal product for the variable input.

3. How do economists and accountants think differently about measuring cost?

4. When output increases, the firm’s average cost of production is likely to fall, at least to a point. Give three possible reasons for this.

5. Briefly describe the characteristics of a perfectly competitive market.

6. What objectives might a firm have other than profit maximization?

7. Write down the first-order conditions that must be satisfied for a profit-maximizing firm.
8. True or false, explain. The demand curve facing a perfectly competitive firm is a horizontal line, whilst the demand curve facing the industry as a whole is downward-sloping.

9. Explain what is meant by producer surplus.

10. Why might a firm continue to produce at a loss? Under what circumstances will it decide to shut down?

11. Explain why a competitive firm’s short-run supply curve is upward sloping.

12. Outline some of the difficulties involved in measuring cost functions.

**Part II: Main Questions**

**Question 1**

Suppose a electric utility has the following production function for Megawatts of electricity:

\[ Q = F(L, K) = L^{\frac{1}{2}}K^{\frac{1}{2}} \]

Moreover, the firm pays $4 per unit of capital and $1 per unit of labor. Remember that a firm's costs are determined by the fact that it pays \( rK \) for its capital and \( wL \) for its labor.

1.1 Does this production function exhibit increasing, decreasing or constant returns to scale?

1.2 What is the marginal product of capital and labor for this firm?

1.3 Find the cost minimizing amounts of capital and labor this firm will use, given that it must produce \( Q \) units of output (Remember the condition that must be satisfied at the cost minimizing level of output).

1.4 What is the cost of producing \( Q \) units of output (given that the firm is using the cost minimizing combination of labor and capital)?

1.5 What is the cost of producing 100 units of output?
1.6 Does this firm have economies or diseconomies of scale?

**Question 2**

Suppose we face an industry in which each firm has the following cost function:

$$C(q_i) = 60 + \frac{q_i^2}{8}$$

where $q_i$ is the output produced by each individual firm. There are exactly 30 firms in this industry, and this industry is perfectly competitive.

2.1 What is the marginal cost for a producer? What are average variable costs, what are fixed costs?

2.2 How much will an individual firm supply given that the market price is $P$?

2.3 What is total supply in this industry, i.e. the total supply produced by all firms at a price of $P$? (call total supply $Q$)

2.4 What are the profits for each firm as a function of $P$?