Comparative Statics Practice Problems

Chapter 7
Intermediate Micro

1. Use the information from an earlier problem that we did in class. You have the optimal combinations of capital and labor and the level of output in your notes.

$$Q = 5K^{\frac{1}{2}}L^{\frac{1}{2}}$$

$$MP_L = \frac{5}{2}K^{\frac{1}{2}}L^{\frac{-1}{2}}$$

$$MP_K = \frac{5}{2}K^{\frac{-1}{2}}L^{\frac{1}{2}}$$

w = \$5
r = \$20
TC = \$1,000

Suppose that *w* increased to \$10, *r* remained at \$20, and total cost was unchanged at \$1,000. Find the optimal quantities of labor and capital that the firm should hire. How much output can the firm produce at the new prices?

2. Use the production function specified in problem #1. Suppose that *w* increased to \$20, *r* remained at \$20, and total output was unchanged at 250 units. Find the optimal quantities of labor and capital that the firm should hire. What is the total cost of producing 250 units of output at the new prices?

3. Suppose that a particular machine requires two workers to produce two units of output. Thus, the production function is Q = min {2K, L}.

TC = \$1,000
w = \$10
r = \$20

Find the optimal quantities of labor and capital that the firm should hire. How much output can the firm produce?

Suppose that *r* decreased to \$5, *w* remained at \$10, and total cost was unchanged at \$1,000. Find the optimal quantities of labor and capital that the firm should hire. How much output can the firm produce at the new prices?

4. Use the production function specified in problem #3. Suppose that *r* decreased to \$5, *w* remained at \$10, and total output was unchanged at 50 units. Find the optimal quantities of labor and capital that the firm should hire. What is the total cost of producing 50 units of output at the new prices? *What is unique about this problem?*

5. Suppose that in order to produce one unit of output a firm can use either one hour of labor time or ¼ hour of machinery time. Thus, the production function is $Q = L + 4K$.

$w = \$10$
$r = \$20$
$TC = \$800$

Find the optimal quantities of labor and capital that the firm should hire. How much output can the firm produce?

Suppose that *r* increased to \$44, *w* remained at \$10, and total cost was unchanged at \$800. Find the optimal quantities of labor and capital that the firm should hire. How much output can the firm produce at the new prices?

6. Use the production function specified in problem #5. Suppose that *r* increased to \$44, *w* remained at \$10, and total output was unchanged at 160 units. Find the optimal quantities of labor and capital that the firm should hire. What is the total cost of producing 160 units of output at the new prices?