

## Problem Set #9

### Perfect Competition

1. ACME produces coffee mugs, and the coffee mug industry is perfectly competitive. The market demand for coffee mugs is given by the following equation:

$$Q = 1000 - 20P$$

ACME, which is identical to every other firm in the coffee mug industry, produces coffee mugs with the following production function:

$$Q = f(K, L) = K^{1/2} L^{1/2}$$

If ACME is using 10 units of capital, and the price of inputs is \$1 per worker for labor and \$4 per unit for capital, then graph ACME ATC, AVC, and MC curves. Write down the expression for ACME's supply curve.

2. Now, assume that there are 9 additional firms in the coffee mug industry. Write down the market supply function for coffee mugs. (Once again, you should assume that the coffee mug firms all use the same production process as ACME.)
3. Find the equilibrium in the coffee mug market.
4. Using your answer from question #3, determine the size of the economic profit/loss being earned by ACME. Illustrate the profit/loss on the firm's cost curve graph that you created for question #1.
5. Based on your answer to #4, what will happen to the number of firms in the coffee mug industry? How many firms will there be in the long run? (In creating your answer you may assume that the inputs prices in the long run will not change – this is a constant cost industry. You may also assume that the optimal plant size for producing coffee mugs involves using 10 units of capital.)
6. Now that you have found the number of firms that will be present in this industry sketch in the new short run supply curve. Also, graph the long run supply curve for the industry.
7. If the market is currently in the long run equilibrium that you have graphed in #6, then what would happen in this industry if:
  - The market demand changed to  $Q = 800 - 20P$
  - The market demand changed to  $Q = 1200 - 20P$
  - The optimal plant size for producing coffee mugs changed from ten units of capital to 20 units of capital?

Hint: You should be sure to do these problems thoroughly – don't just use graphical analysis the way that we did in class.