**Instructions:** Only one section will be graded for correctness. The rest will graded on completion. You will get 50% for completing the homework assignment with an honest effort and 50% for the graded problem. You may work with one other student. If you do, please only turn in one copy with both of your names on it. Be sure to show all work.

## 1: Production Functions

Zack Inc. makes printer ink. The production of ink requires both labor and capital. The production function can be defined as: $q = 2L^{\frac{1}{3}}K^{\frac{2}{3}}$

**(a)** Show that Zack Inc. has constant returns to scale.

**(b)** Suppose the wage rate for works is \$3. Also, each unit of capital earns \$6. Finally, the price of ink in this economy is \$1. Write the profit function for Zack Inc. in terms of capital and labor.

**(c)** Assume that the optimal quantity of ink produced is 100. Find the best combination of L and K that Zack Inc. should choose to make 100 units of ink.

**(d)** Find the profit level when Zack Inc. makes 100 units of ink.

## 2: Total Cost

Jimmy Jon's Hot Dog Stand is able to hire labor for \$4. The rental rate of capital is \$2. Jimmy Jon can make hot dogs by combining labor with capital. Specifically, his production of hot dogs looks like $q = K^{\frac{1}{2}}L^{\frac{1}{2}}$.

**(a)** Find TC as a function of just L.

**(b)** Find q as a function of just L.

**(c)** Find TC as a function of just q.

**(d)** Does the TC function in part c show constant, decreasing, increasing, or efficient returns to scale?

**(e)** What is the marginal cost of each new hot dog sold?

**(f)** Find the Average Cost function for Jimmy Jon.

## 3: More Total Cost

**(a)** Assume that $TC = 3q + q^2 + 100$. What are the fixed costs? What are the variable costs?

**(b)** Does this function have constant, decreasing, increasing, or efficient returns to scale?

**(c)** Now assume that $TC = 3q^2 + 4q^3 + 10$. Find the AC and MC functions. Also, draw the MC curve with q on the x-axis and MC on the y-axis.

**(d)** Does this function have constant, decreasing, increasing, or efficient returns to scale?

## 4: Profit in the Short Run and Long Run

The demand for staples can be described as $P = 2 - q$. Staples, an office supply store, is trying to figure out how many staples to sell. Staples has a fixed cost of 10 and a variable cost of $q^2$.

**(a)** Find the profit function.

**(b)** At which point does staples maximize their profit?

**(c)** Should Staples shutdown in the short-run? Why or why not?

**(d)** Should Staples shutdown in the long-run? Why or why not?

## 5: Welfare Economics and International Trade

**(a)** There is a perfectly competitive market for the selling and purchasing of bees in the country of Freedonia. Assume that consumer preferences change such that each consumer is less happy consuming bees. Using both a firm and market graph, show the effects of this change in preferences in the short-run. What happens to price, quantity, and each firm's profit?

**(b)** On the graphs from part a, show the effect of the change of preferences in the long-run. What happens to price, quantity, and each firm's profit?

**(c)** Let the demand function be $P = 10 - Q^d$. The supply function is $P = 1 + 2Q^s$. Find the consumer surplus and producer surplus in equilibrium.

**(d)** Now, Freedonia starts to trade with other countries. The world price is now set equal to \$3. Find the consumer surplus and producer surplus in equilibrium.

**(e)** Freedonia adds a tariff of \$1. Find the consumer surplus, producer surplus, tax revenue, and dead weight loss in equilibrium.