Intermediate Microeconomics
Fall 2009

Problem Set 2

1. Suppose that Natasha's utility function is given by $u(I) = I^{0.5}$, where I represents annual income in thousands of dollars.

   1) Is Natasha risk loving, risk neutral, or risk averse? Explain.

   2) Suppose that Natasha is currently earning an income of \$10,000 (I = 10) and can earn that income next year with certainty. She is offered a chance to take a new job that offers a 0.5 probability of earning \$16,000, and a 0.5 probability of earning \$5,000. Should she take the new job?

   3) In (2), would Natasha be willing to buy insurance to protect against the variable income associated with the new job? If so, how much would she be willing to pay for that insurance? (Hint: What is the risk premium?)

2. Suppose that the process of producing lightweight parkas by Polly's Parkas is described by the function $Q = 10K^{0.8}(L-40)^{0.2}$, where Q is the number of parkas produced, K is the number of machine hours, and L is the number of person-hours of labors.

   a) Derive the cost-minimizing demands for K and L as a function of Q, wage rates (w), and rental rates on machines (r). Use these to derive the total cost function.
   b) This process requires skilled workers, who earn \$32 per hour. The rental rate is \$64 per hour. At these factor prices, what are total costs as a function of Q? Does this technology exhibit decreasing, constant, or increasing returns to scale?
   c) Polly's Parkas plans to produce 2000 parkas per week. At the factor prices given above, how many workers should they hire (at 40 hours per week) and how many machines should they rent (at 40 machine-hours per week)? What are the marginal and average costs at this level of production?

3. A firm has the production function $Q = 20K^{0.75}L$, where Q is the output, L is the working hours of labor and K the rental capital (measured by hours as well). The market wage per hour is 6, and the rental price of capital per hour is 8.

a) Characterize the returns to scale of the production technology of the firm;
b) Suppose that the firm is currently employing 20 hours of labor and 54 hours of rental capital. Is this allocation optimal for the firm? Why?

4. The short-run cost functions of two firms are given by

$$C_1 = 100 + y_1^2 \text{ and } C_2 = 16 + 8y_2 + y_2^2.$$

a) Suppose the two firms are plants of the same firm in a competitive market. If the firm wants to produce 24 units of output, how much should it produce in each plant? Why not produce this output simply in one plant? Briefly explain.

b) Suppose the two firms act independently. What is the short-run supply curve of the two firms?

c) If the price is 6, what is the number of firms active in the market in the short run? Explain why.

5. A firm produces a product with labor and capital and its production function is described by Q = LK, where L denotes labor and K denotes capital. Suppose that the price of labor (*w*) equals 2 and the price of capital (*r*) equals 1. Derive the equations for the long-run total cost curve and the long-run average cost curve。

6. Suppose the market for widgets can be described by the following equations

Demand: P = 10 – Q; Supply: P = Q – 4.

where Q is the quantity in thousands of units and P is the price in dollars per unit.

a) What is the equilibrium price and quantity?
b) Suppose the government imposes a tax of $1 per unit to reduce widget consumption and raise government revenues. What will the new equilibrium quantity? What price will the buyer buy? What amount per unit will the seller receive?
c) Suppose the government has changed its mind and decide to remove the tax and grant a subsidy of $1 per unit to widget producers. What will equilibrium quantity be? What amount per unit (including the subsidy) will the seller receive? What will be the total cost to the government?