

Intermediate Microeconomics

Problem Set 2

(Due Date: Nov. 14)

1. Jane owns a house that is worth \$100,000. She cares only about her wealth, which consists entirely of the house. In any given year, there is a 20% chance that the house will burn down. If it does, its scrap value will be \$22,500. Jane's von Neumann-Morgenstern utility function is $u(W) = W^{1/2}$.
 - a) Is Jane risk averse, risk neutral or a risk lover? Explain.
 - b) What is the expected monetary value of Jane's uncertainty?
 - c) What is the maximum that Jane is willing to pay to completely insure her house against being destroyed by the fire?
 - d) Say that Homer is the president of an insurance company. He is risk neutral and has a utility function of the following type $u(W) = W$, where W is his wealth. What is the lowest price at which he is willing to provide a fair insurance contract to completely insure Jane's risk?
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.
 - e) 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.
 - f) 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?
 - g) 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. 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.

4. 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.
- a) Suppose that in the short run, capital level is fixed at $K=10$. Write down mathematical expressions for the short run total average cost curve, average variable cost curve, average fixed cost curve, and marginal cost curve.
 - b) Derive the long-run total cost curve, average cost curve and marginal cost curve.
5. 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 pay? 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?