

Intermediate Microeconomics

Fall 2025 - M. Chen, M. Pak, and B. Xu

Problem Set 3: due in class, the week of Nov. 3

1. Consider an individual whose utility function over money is $u(w) = 1 + 2w^{\frac{1}{2}}$.
 - (a) Determine the individual's attitude toward risk. Does it depend on w ?
 - (b) Suppose the individual has initial wealth $\$W$ and faces the possible loss of $\$ \frac{W}{2}$. The probability that the loss will occur is $\frac{1}{2}$. Suppose insurance is available at price p , where p is not necessarily the fair price. Find the optimal amount of insurance the individual should buy. You may assume that the solution is interior.
 - (c) Is there a price at which the individual will not want to buy any insurance? If so, find it. If no, explain.

2. Consider an investor whose utility function over money is $u(w) = w^a$, where $0 < a < 1$. The investor can invest in a riskless asset that returns 1 (gross return per \$1 invested) for sure, or a risky asset that returns (gross) 1.1 with probability $\frac{3}{5}$ and 0.9 with probability $\frac{2}{5}$.
 - (a) Find the investor's Arrow-Pratt measure of absolute risk aversion. Is the investor risk averse, risk neutral, or risk loving? How does her degree of absolute risk aversion change as her wealth changes?
 - (b) Suppose the investor's initial wealth is $\$W$. Find the optimal amount to invest in the risky asset (use x to denote the amount invested in the risky asset).
 - (c) How does the amount invested in the risky asset changes as the investor's wealth increases? Give a brief explanation of this result (in light of part (a)).

3. Suppose a firm's production function is given by $f(L, K) = L^a K^b$, where $a > 0$ and $b > 0$. As usual, let w , r , and p be the price of labor, capital, and the output good, respectively.

- (a) A firm has a constant returns to scale if $f(\lambda L, \lambda K) = \lambda f(L, K)$ for all $\lambda > 0$. It has a decreasing returns to scale if $f(\lambda L, \lambda K) < \lambda f(L, K)$ and an increasing returns to scale if $f(\lambda L, \lambda K) > \lambda f(L, K)$ for all $\lambda > 1$, respectively. Determine the conditions on a and b under which the firm has constant, decreasing, and increasing returns to scale, respectively.
- (b) Find the firm's (long-run) cost function.
- (c) Suppose a and b are such that the firm has decreasing returns to scale. Is the cost function concave, linear, or convex function of q (output quantity)? Find the firm's (long-run) supply function.
- (d) Suppose a and b are such that the firm has increasing returns to scale. Is the cost function concave, linear, or convex function of q ? What is the firm's (long-run) profit maximizing output level?
- (e) Suppose a and b are such that the firm has constant returns to scale. Is the cost function concave, linear, or convex function of q ? Find the firm's (long-run) supply function. What does this say about the shape of firm's (long-run) supply curve?

4. Consider a market where the supply and the demand are given by

$$Q^S(P) = 100P \quad \text{and} \quad Q^D(P) = 2000 - 100P.$$

- (a) Find the equilibrium price, quantity, consumer surplus, producer surplus, and the aggregate surplus.
- (b) Suppose the government wants to raise revenue by imposing tax of ¥4 per unit. What is the price producers get, the price consumers pay, the equilibrium quantity, the tax revenue, and the dead weight loss?
- (c) Suppose the government is thinking about imposing an ad valorem tax instead of per unit tax. What does the tax rate has to be to keep the price consumers pay the same as in the per unit tax case?
- (d) Which tax scheme is better for the economy? Why?

5. Consider again the market where the supply and the demand are given by

$$Q^S(P) = 100P \quad \text{and} \quad Q^D(P) = 2000 - 100P.$$

- (a) Suppose the government imposes a price floor of $P_f = 12$. Assuming that the government buys any excess supply, find the consumer surplus, producer surplus, government revenue, and aggregate surplus. What is the deadweight loss (in comparison to the no intervention case)?
- (b) Suppose the government imposes a price ceiling $p_c = 8$. What is the change in consumer surplus from the no intervention case?
- (c) In general (i.e., do not restrict attention to the supply and the demand functions given above), will consumers always benefit from price ceiling? (A carefully drawn graphical example will suffice).