

Problem Set #1

Due at the **beginning** of class Thursday 8, October

1. Suppose the demand equation for a resource is  $Q_D = 100 - 4P$ .  
Suppose the competitive industry supply equation is  $Q_S = -20 + 8P$ .
  - a. Graph these two functions on a conventional supply-and-demand graph (Q on the horizontal axis; P on the vertical). Label the market equilibrium point.
  - b. Mathematically calculate the market-clearing equilibrium values for P and Q where  $Q_S = Q_D$ . Check that these values correspond to the equilibrium point on your graph.
  - c. Calculate the point elasticities of demand and supply with respect to price at this equilibrium point. Show your work.
  - d. Calculate the producer and consumer surpluses accruing in this market. Show your work.
2. Suppose you have just bought a \$1 lottery ticket giving you a 1-in-2 million chance of winning \$1 million. If you win, you will receive your money in 20 annual installments of \$50,000 each, and state and local taxes will take 40% of this, leaving you with \$30,000/year for 20 years. Discounting the future installments at an annual rate of 5 percent, calculate the present value of the prize. Calculate the expected present value of your \$1 ticket.
3. You have just invested \$50,000 in an antique car. Suppose you can either sell it for \$55,500 two years from now, or else sell it for \$75,000 five years from now. Which option yields the higher implicit rate of return?
4. Consider two people, Claude and Tom. Claude's gets utility from two things, broccoli (B) and ham (H), according to the following utility function:  $HB$  (i.e the product of the quantity of ham and the quantity of broccoli). Similarly, Tom gets utility from the consumption of broccoli and ham according to:  $\overline{HB}$ . Suppose that Tom and Claude have  $\overline{H}$  units of ham and  $\overline{B}$  units of broccoli to split between them.
  - a. Derive an expression for the contract curve.
  - b. If  $\overline{H} = 10$  and  $\overline{B} = 20$ , Draw the Edgeworth box and plot the contract curve (put H on the horizontal axis and B on the vertical axis).
  - c. Is the allocation (3, 6) for Claude and (7, 14) for Tom on the contract curve? What are the implied equilibrium prices?
  - d. Consider the allocation (6, 8) for Claude and (4, 12) for Tom. Is this allocation Pareto efficient? If not, find an allocation that represents a Pareto improvement.