

**Economics 200C: Problem Set III**

Due: April 21, 2009

1. You and a friend buy identical objects while vacationing. Both of the items break while being transported back to California. The airline is obliged to pay for damages, but does not know the value of the objects. The airline phones you and your friend and says: "I know that the vase is worth being \$100 and \$200. Tell me exactly how much you paid for it (an integer between 100 and 200). I will pay you the minimum of the claims made by you and your friend. In addition, if one claim is strictly less than the other, I will pay the person who makes the smaller claim an additional \$2." Assume that both you and your friend must answer the airline's question simultaneous (and therefore without knowing the other answer) and seek to maximize the settlement they receive from the airline. Identify rationalizable strategies for this game. Characterize equilibrium outcomes.
2. Consider the game below.

	L	C	R
U	100, 100	-110, 101	-110, 101
M	101, -110	-90, -90	-100, -100
B	101, -110	-100, -100	10, 10

- (a) Show that  $U$  and  $L$  are strictly dominated.
  - (b) Find all Nash Equilibria of the game.
  - (c) Assume now that the game is repeated once. That is, players simultaneously select an action (one of the three strategies in the given game); they receive a payoff according to the table above; they choose another action. Payoffs are the sum of the two stage-game payoffs.
    - i. How many strategies do each player have in this (once-repeated) game?
    - ii. Construct an equilibrium of the game in which the first period outcome is  $(U, L)$ . How can this be consistent with part a?
3. Consider a game in which a monopoly seller has a product that can be produced at zero marginal cost. She faces a continuum of consumers. Consumer  $v$  values the item at  $\$v$  ( $v$  is both the name of the consumer and his valuation). Assume that  $v$  is uniformly distributed on  $[0, 1]$ .
  - (a) Suppose that the seller sets a single, take-it- or-leave-it price  $p$ . Upon seeing the price, each consumer decides (individually) whether to accept or reject. If consumer  $v$  accepts, his payoff is  $v - p$ . If he rejects, it is 0. Describe subgame-perfect equilibria of this game. The seller earns  $p$  for each sale that she makes. Are there other equilibria?

- (b) Now suppose that the game lasts two periods. The seller sets two prices,  $p_1$  and  $p_2$ . She earns  $p_1$  for each first period sale, and  $\delta p_2$  for each second period sale ( $\delta \in (0, 1)$  is the discount factor). Assume first that the seller can commit to setting two prices. That is, she announces  $p_1$  and  $p_2$  in advance. Consumers decide which period in which to buy (each consumer buys at most one item), earning  $v - p_1$  for a first period purchase and  $\delta(v - p_2)$  for a second-period purchase. Compute a subgame-perfect equilibrium and compare the outcome to your answer in part (a).
- (c) Continue part (b), but now assume that the seller cannot make commitments. First she announces  $p_1$ ; then consumers decide whether to buy; then she announces  $p_2$ ; finally consumers decide whether to accept the second price. Describe subgame-perfect equilibria to this game. Compare the profit to the profit in parts (a) and (b).

Try to be careful about describing the strategy sets in this problem.

4. Consider a game in which player 2 (the “entrant”) first choose in (to enter a market) or out (to not enter). If 2 chooses out, payoffs to players 1 and 2 are  $(4, 0)$ . If 2 chooses in, player 1 chooses to acquiesce (payoffs  $(2, 2)$ ) or fight (payoffs  $(-2, -2)$ ). Draw the normal and extensive forms for this game. Find all Nash equilibria of the game. Which ones involve dominated strategies? Now suppose Firm 1 plays this game with a sequence of  $N - 1$  entrants. The games are played sequentially, so that entrant  $i$  gets to see the outcome of the games played with all lower-numbered entrants before playing. Exhibit a Nash equilibrium in which none of the entrants enter. Which (if any) of the strategies in this equilibrium are (strictly or weakly) dominated? Do the same for an equilibrium in which only the final entrant enters. What is the outcome of the iterated removal of weakly dominated strategies in this game?