ECON 2200: Problem Set 1

Due September 8th 2008, 11:00 a.m.

1. Consider the following games, in which player 1 chooses the row and player 2 chooses the column:

	L	R
U	$1, 1$	$0, 0$
D	$0, 0$	$0, 0$

game 1

	L	R
U	$1, 1$	$0, 1$
D	$1, 0$	$-1, -1$

game 2

	L	l	r	R
U	$1, 1$	$1, 2$	$0, 0$	$0, 0$
M	$1, 1$	$1, 1$	$10, 10$	$-10, -10$
D	$1, 1$	$-10, -10$	$10, -10$	$1, -10$

game 3

In each case, find the set of Nash equilibria.

2. Consider the Cournot model, in which n firms simultaneously choose the quantities $q_i \geqslant 0$ they will sell on the market. The price for each unit is given by $p = 1 - Q$, where $Q = \sum_{i=1}^{n} q_i$. There are no costs, so the profit (and utility) of each firm is given by $\pi_i = pq_i$.

   (a) Find the Nash equilibrium, showing that it is unique and symmetric.

   (b) Suppose that $n = 2$. Which strategies for each player survive iterated deletion of strictly dominated strategies? Comment briefly.

   (c) Repeat part (b) for the case of $n = 3$.

3. Suppose a group of citizens are faced with the following public goods contribution problem: the benefit to each citizen if the good is provided is 1; the cost of contributing to the good is $\frac{3}{8}$; and the good will be provided if at least 2 citizens contribute. Citizens choose simultaneously whether to contribute or not, and costs are not refunded even if the good is not provided.

   (a) Suppose there are just 3 citizens. Find all symmetric (mixed-strategy) Nash equilibria of the game, and compute the probability that the good is provided in each case.

   (b) Repeat part (a) for the case where there are 4 citizens.

4. A game is *dominance solvable* if all players are indifferent between all outcomes that survive the iterative procedure in which *all* the weakly dominated actions of each player are eliminated at each stage. Consider the following game: each of two players announces a nonnegative integer equal to at most 100. If $a_1 + a_2 \leqslant 100$, where a_i is the number announced by player i, then each player i receives payoff a_i; if $a_1 + a_2 > 100$ and $a_i < a_j$, then player i receives a_i and player j receives $100 - a_i$; if $a_1 + a_2 > 100$ and $a_1 = a_2$, then each player receives 50. Show that the game is dominance solvable, and find the set of surviving outcomes.