14.12 Game Theory
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Midterm 1

October 17th, 2005 (80 minutes)
Good Luck!

1. Below there are two pairs of games. For each pair check whether they represent the same preference relation on the lotteries with strategy profiles as their outcomes. (Show your work.)

   (a) (10 points)

	L	R
T	1,0	4,1
B	2,4	3,2

	L	R
T	1,0	4,1
B	2,3	3,2

   (b) (10 points)

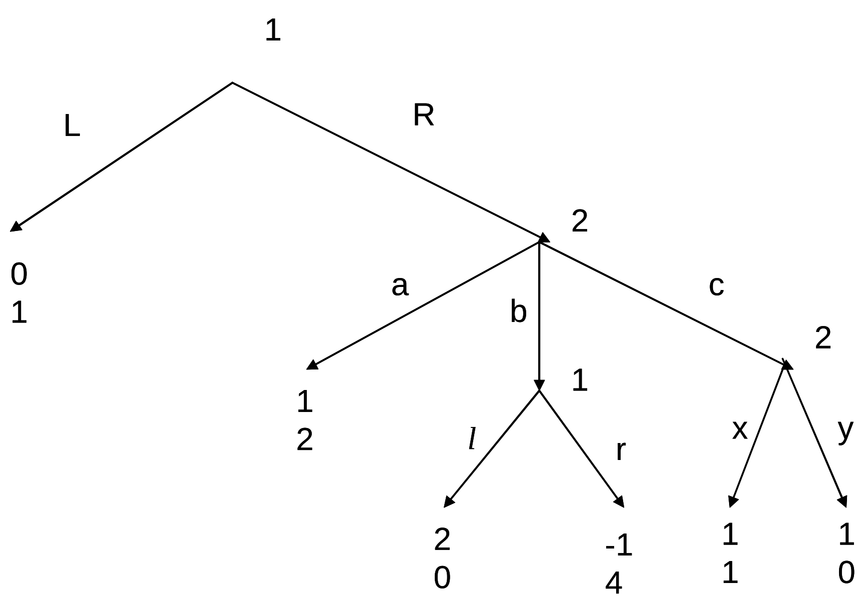
	L	R
A	0,1	6,4
B	2,4	4,7
C	4,-2	2,1

	L	R
A	1,0	4,1
B	2,1	3,2
C	3,-1	2,0

2. (25 points) Find all the Nash equilibria in the following game. (Don't forget the mixed strategy equilibrium, which is 13 points.)

	L	M	R
A	1,0	4,1	1,0
B	2,1	3,2	0,1
C	3,-1	2,0	2,2

3. Consider the following game in extensive form.



(a) (10 points) Use backwards induction to compute an equilibrium.

(b) (10 points) Write this game in normal form.

(c) (10 points) Compute the set of rationalizable strategies.

4. (25 points) Senate is to choose the estate tax rate $x \in X = \{0, 0.01, 0.02, \ldots, 0.99, 1\}$. There are 45 hard-core Republicans, represented by the Majority Leader, 40 hard-core Democrats, represented by the Minority Leader, and 14 Moderates, represented by the Moderate Leader. The payoff of Republicans is $1 - x$; the payoff of Democrats is x, and the payoff of Moderates is x if $x \leq 1/2$ and $1 - x$ if $x \geq 1/2$. The current estate tax rate is $x_0 = .6$ (i.e., 60%).

   First, the Majority Leader introduces a bill $x_1 \in X$. Then, the Minority Leader introduces an amendment $x_2 \in X$. According to the Senate rules, first the amendment x_2 is voted against the bill x_1 and the winner of these two is voted against x_0. The winner of the last vote is introduced as the estate tax rate.

   The winner in each vote is the alternative that collects 50 or more votes. In each vote, first the Majority Leader votes for all the hard-core Republicans, then the Minority Leader votes for the hard-core Democrats, and finally the Moderate Leader votes for the Moderates.

   Use backwards induction to compute an equilibrium of this game.

   [You can restrict your attention to the case $x_1 \leq 0.5 \leq x_2$; you don't need to describe entire strategy, but you need to determine the outcomes of the votes, x_2 as a function of x_1, and x_1.]