Final Exam: Economics 101

You have three hours. Do all 5 questions; each has equal weight. Please be sure to number each problem by number and part, especially if you choose to do them out of order. Good luck.

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1. Normal Form Games

In each of the following games

i) Find all of the pure strategy Nash equilibria.

ii) Determine whether or not there is a mixed strategy Nash equilibrium (in addition to the pure equilibria which are also considered mixed), and if so, what it is.

iii) Which of these equilibria are Pareto efficient?

iv) Do any of the pure strategy equilibria involve playing weakly or strictly dominated strategies?

v) Sketch the socially feasible set.

vi) Find a pure strategy that maximizes the payoff each player is guaranteed no matter how the other player plays (this is called the maxmin payoff). Also find a pure strategy that minimizes the payoff the other player can get (this is called the minmax payoff). Sketch the corresponding socially feasible individually rational set.

a)

	L	R
U	-1,0	2,1
D	-3,3	4,2

b)

	L	R
U	-1,5	-1,1
D	-2,1	5,4

c)

	L	R
U	5,5	9,8
D	8,9	11,10

2. Repeated Games

	L	R
U	4,4	0,8
D	5,0	1,1

Suppose that this stage game is repeated between two infinitely lived players with discount factor equal to δ. Propose a strategy and a discount factor δ such that the Nash equilibrium outcome of the game is for both players to play UL. Are these strategies subgame perfect? What does the Folk Theorem tell us about this game?

3. Long Run versus Short Run

	L	R
U	2,4	0,0
M	5,0	1,11
D	11,0	1,3

Suppose that this stage game is repeated between infinitely-lived player 1 (row player) with discount factor equal to δ and a sequence of short-lived player 2's (column players). What pure strategy Nash equilibria are in the stage game? What is the Stackelberg equilibrium of the stage game in which player 1 moves first? Propose a strategy and a discount factor δ such that in equilibrium players end up playing the Stackelberg equilibrium.

4. Decision Analysis

An employer must decide whether or not to introduce mandatory drug testing for his employees. The test correctly identifies a drug user 90% of the time. It mistakenly identifies a non-drug user as a drug user 5% of the time. Employing a drug using employee costs $10,000 per year. Firing a non-drug using employee costs $20,000 per year. In all other cases drug-related costs are 0. In this industry, 25% of employees use drugs. How much is the employer willing to pay (per year) for the testing program? You may not use a calculator, but you may round off.

5. Cournot with Uncertain Cost

Consider a Cournot Duopoly with demand $p = 17 - x$. There are two possible levels of marginal cost: low and equal to 1 or high and equal to 3. There is a 40% chance both firms are high cost, a 40% chance they are both low cost, a 10% chance firm 1 is high cost and firm 2 low cost, and a 10% chance firm 1 is low cost and firm 2 high cost. Assuming that each firm knows its own marginal cost and these probabilities, what are the equilibrium strategies of the two firms in the Bayesian Nash equilibrium of the Cournot

Game? Please note that you must use conditional probabilities to correctly solve this problem.

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