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.

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, 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	2,5	-1,1
D	1,-1	5,2

b)

	L	R
U	5,5	-1,8
D	8,-1	1,1

c)

	L	R
U	-1,3	-3,5
D	-3,5	-1,3

2. Repeated Games

	L	R
U	3,3	0,5
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 equilibrium outcome of the game is for both players to play UL.

3. Long Run versus Short Run

	L	R
U	2,1	0,0
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 UL.

4. Screening

A recent college school graduate must decide whether to go get an MBA or to continue working as a car salesperson for a utility of 5. With probability .9 the graduate is a nerd, and with probability .1 he is a surfer dude. He knows whether or not he is a nerd, but business school recruiters do not. It costs 1 unit of utility to go to business school. The business school recruiter must decide whether to offer a straight contract, or an incentive contract in which extra hard work is repaid by extra time off. The nerd gets a utility of 8 from the straight contract (don't forget the cost of getting the MBA though) and a utility of 5 from the incentive contract, since it just means he has to work harder, and time off has no value to a nerd. On the other hand, the surfer dude gets a utility of 5 from the straight contract, but gets 8 from the incentive contract, since he can work hard, and spend the extra time surfing. The recruiter gets a bonus of 1 from his employer if he can hold labor costs down to 5, otherwise he gets nothing.

a) Draw the extensive form of the game.

b) Find the normal form.

c) What are the pure strategy Nash equilibria?

d) What is the mixed strategy Nash equilibrium?

e) In this mixed strategy equilibrium, what are the beliefs of the recruiter about the type of MBA graduate he gets? (You will need to use Bayes law to answer this.)

5. Price Discrimination

You may sell either 1 or 2 units of a good to a consumer. (You may not sell 0 units, and there is no production cost.) You know that this consumer is one of two types type H

(high demand) and type L (low demand), and that both types are equally likely (probability 1/2). The high demand type has utility function $(5-p)x$, and the low demand type has utility function $(3-p)x$, where p is the price paid per unit and x is the number of units purchased. You do not know the consumer's utility function, but the consumer does. So you choose to have the consumer play a "demand revelation game." In this game the strategy of the consumer is to announce either that he is type H or type L. (This is a one-person game.) You choose how the price and quantity depend on the announcement; that is, you choose four numbers p^H, x^H, p^L, x^L, where x^H, x^L must be 1 or 2 units (the only amounts you are allowed to sell).

a) For what values of p^H, x^H, p^L, x^L is it an optimal strategy for the consumer to tell the truth?

b) For what values of p^H, x^H, p^L, x^L is it an optimal strategy for a truth-telling consumer to enter the game? (He gets utility zero if he decides not to buy from you.)

c) If you restrict yourself to choosing p^H, x^H, p^L, x^L so that the consumer chooses to buy from you and to tell the truth, what values of p^H, x^H, p^L, x^L maximize your expected revenue? Be sure to consider all possible cases, bearing in mind that you may sell 1 unit or 2 but not 0 units.