

Final Exam: Economics 101

You have three hours. Do all 5 questions; each has equal weight. Good luck.

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1. Normal Form Games

In each of the following games, find all of the pure strategy Nash equilibria, determine whether or not there is a mixed strategy Nash equilibrium, and if so, what it is. Which of these equilibria are Pareto efficient? Do any of the pure strategy equilibria involve playing weakly or strictly dominated strategies? In each case, sketch the socially feasible set. (You need not worry about individual rationality in answering this question.)

a)

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

b)

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

c)

	L	R
U	6,6	2,8
D	8,2	3,3

2. Long Run versus Short Run

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

Suppose that this stage game is repeated between infinitely-lived player 1 with discount factor equal to δ and a sequence of short-lived player 2's. What pure strategy Nash equilibria are there 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.

3. Screening

A high school graduate must decide whether to go to college or to find a job immediately. With probability .5 the graduate is smart, and with probability .5 he is dumb. He knows whether he is smart or dumb, but prospective employers do not. If he is smart he gets utility 2 from going to school; if he is dumb he gets utility -2. The employer must decide whether to offer a high or a low wage after observing whether or not the job applicant is a college graduate. Both smart and dumb applicants get a utility of 1 from the high wage job and 0 from the low wage job. The employer gets one if he offers the high wage job to the smart applicant or the low wage job to the dumb applicant; he gets minus one if he offers the low wage job to the smart applicant (who will sabotage all his equipment) or the high wage job to the dumb applicant. Draw the extensive form of the game. Find the normal form. What are the pure strategy Nash equilibria?

4. Decision Analysis

An individual takes a cancer test. Suppose that 20% of people taking the test have cancer, and that the test is wrong 5% of the time. This person must decide whether or not to have a dangerous operation. Suppose that the costs and benefits are given by the utilities below

	Operation	No Operation
Cancer	0	-100
No Cancer	-50	10

Should this person have the operation given that they tested positive?

5. Cournot with Uncertain Cost

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