Midterm Exam

3/26/2015

Instructions: You may use a calculator and scratch paper, but no other resources. In particular, you may not discuss the exam with anyone other than the instructor, and you may not access the Internet, your notes, or books during the exam.

If you don't know how to answer a question, go as far as you can. Sometimes substantial points can be awarded for the right setup. Similarly, if a problem requires multiple steps, it is important that you clearly describe your progression through those steps, even if you know the correct numerical answer. You have 90 minutes to complete the exam. Good luck!

Problem 1 Consider the following game:

	Y	Z
W	a,b	c,d
X	e,f	g,h

a. List all inequalities that must hold for (W, Y) to be a dominant strategy equilibrium.

b. List all inequalities that must hold for (W, Y) to be a Nash equilibrium.

Problem 2 Consider the following game:

		Stringer	
		L	R
Avon	T	4,8	0,0
	B	8,20	X,Y

a. If (B, R) is the Nash equilibrium of this game, what must be true of X and Y? Your answer should be two inequalities, one for X and one for Y.

b. If this game is played sequentially, with Avon moving first and (B, R) is the subgame perfect equilibrium outcome, what must be true of X and Y? Your answer should be two inequalities, one for X and one for Y.

Problem 3 This problem refers to the following game:

	A	B	C
A	4,4	0,5	-1,0
B	5,0	1,1	0,0
C	0,-1	0,0	1,1

a. What are the pure strategy Nash equilibria?

b. Is there a mixed strategy Nash equilibrium where both players mix A and B? If so, find the equilibrium. If not, explain why not.

c. Is there a mixed strategy Nash equilibrium where both players mix B and C? If so, find the equilibrium. If not, explain why not.

Problem 4 Consider an infinitely repeated version of the game below:

		Player 2 C	Player 2 D
Player 1	C	7,7	4,8
	D	8,4	5,5

Suppose both players use the following strategy:

(I) Play C initially, and as long as (C, C) has been played in every previous period.

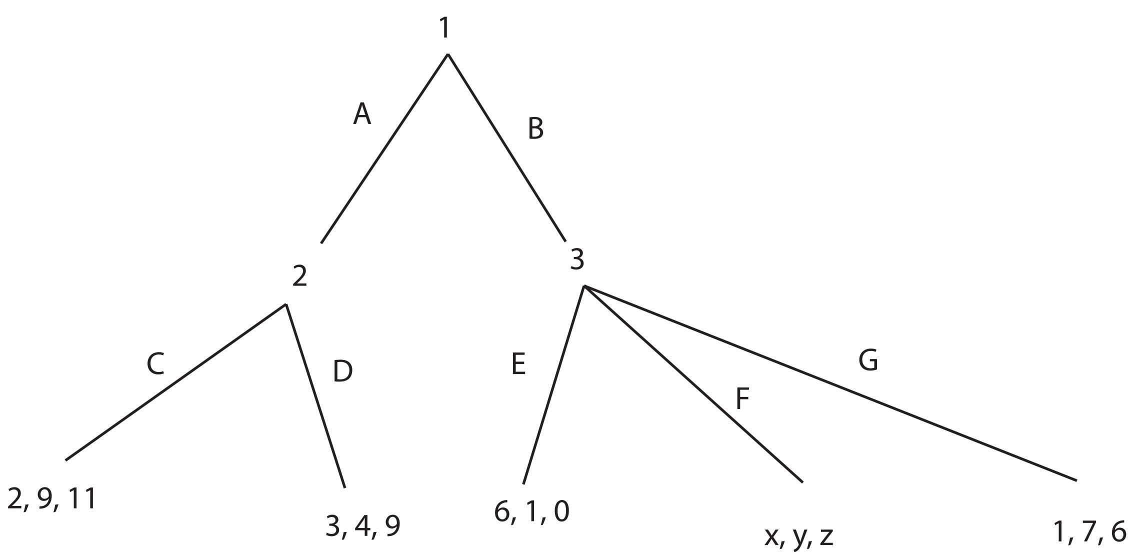
(II) If any player has ever deviated from (I), play D forever after.

a. Suppose both players share a common discount factor, δ. For what values of δ do the above strategies comprise a subgame perfect equilibrium of the repeated game?

b. Suppose that the payoffs for (D, D) increased to $(6, 6)$. In this new game, for what values of δ do the above strategies comprise a subgame perfect equilibrium of the repeated game?

c. Is it easier to sustain cooperation in part a. or part b.? Provide some intuition for your answer.

Problem 5 Consider the game below.



a. What must be true of x, y, and z for outcome F to occur in a subgame perfect equilibrium of this game?

b. Suppose $z = 5$ and $x = y = 20$. What is the subgame perfect equilibrium of this game?

Problem 6 Consider the infinitely repeated version of the following stage game:

		Player 2	
		A	B
Player 1	A	5,5	-2,10
	B	10,-2	0,0

Suppose each player plays the following strategy:

(Phase I) Play A initially; remain in phase I so long as no deviation occurred in the previous period. If either player deviates, move to Phase II in the following period.

(Phase II) Play (B, B) for T periods. If either player deviates, restart Phase II. After T periods, return to Phase I.

Suppose that both players have a common discount factor, $\delta = \frac{4}{5}$. Find the minimum value of T for which the above strategies comprise a subgame perfect equilibrium of the repeated game. Most of the points will be awarded for correctly describing the inequality which determines this δ.