Quiz 4

3/23/2012

Instructions: You have 50 minutes to complete this exam. For the short-answer questions, please support your answers by showing your work and writing out complete explanations for any claims you make. Good luck!

Problem 1 (10 points) Answer parts a-b about the game below:

		2		
		L	C	R
1	T	a,b	c,d	e,f
	M	g,h	i,j	k,l
	B	m,n	o,p	q,r

a. Write down all inequalities necessary for M, C to be a Nash equilibrium. (an example of an inequality is $a \leq r$)

$i \geq o$, $i \geq c$, $j \geq l$, $j \geq h$.

b. Write down all inequalities necessary for M, C to be a dominant strategy equilibrium.

$i \geq o$, $i \geq c$, $j \geq l$, $j \geq h$, $g \geq m$, $g \geq a$, $k \geq q$, $k \geq e$, $d \geq b$, $d \geq f$, $p \geq n$, $p \geq r$.

Problem 2 (5 points) Lori employs Max. She wants him to work hard rather than to loaf. She considers offering him a bonus or not giving him one. All else the same, Max prefers to loaf.

		Max	
		Work	Loaf
Lori	Bonus	1,2	-1,3
	No bonus	3,-1	0,0

If Max and Lori choose actions simultaneously, find all Nash equilibria of this game, pure as well as mixed (if there are any).

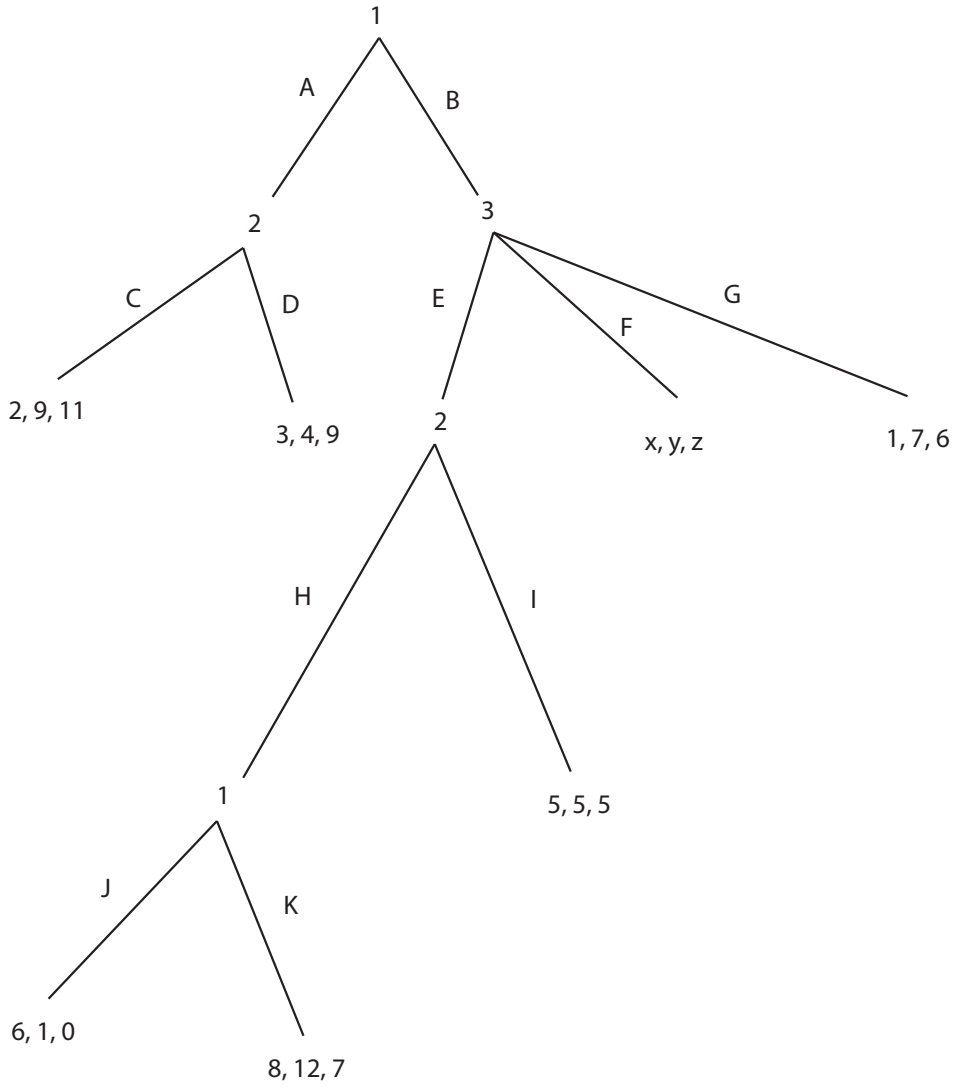
The Nash equilibrium is 'No bonus, Loaf'. Note that this game is a prisoners dilemma.

Problem 3 (5 points) Consider the following game:

		Microsoft	
		A	B
Apple	C	1,1	6,-1
	D	-1,6	3,3

Final all Nash equilibria of this game, pure as well as mixed (if there are any).

There is one Nash equilibrium, at C, A.



Problem 4 (10 points) (**10 points**) Consider the game above. What must be true of x, y, and z for outcome F to be played in an equilibrium of this game? (Your answer should be of the form "x can be anything, y must be less than -17, and z must be at least 100")

$z \geq 7$, $x \geq 2$. y can be any number at all.

Problem 5 (10 points) A thug wants the contents of a safe and is threatening the owner, the only person who knows the code, to open the safe. "I will kill you if you don't open the safe, and let you live if you do." Should the information holder believe the threat and open the safe? The table below shows the value that each person places on the various possible outcomes:

	Thug	**Safe's owner**
Open the safe, thug does not kill	4	3
Open the safe, thug kills	2	1
Do not open, thug kills	1	2
Do not open, thug does not kill	3	4

Such a game appears in many movies, including *Die Hard*, *Crimson Tide*, and *The Maltese Falcon*.

a. Draw the game tree. Who moves first?

The safe's owner would move first (obviously, should he be shot, he cannot open the safe). He decides to open or not, and the the thug decides to kill him or not.

b. What is the equilibrium?

The subgame perfect Nash equilibrium is for the owner to not open the safe, and the thug to not kill the owner.

c. Is the thug's threat credible?

No. Should the owner refuse to open the safe, the thug is better off not killing him.

d. Does the safe owner open the safe in a subgame perfect Nash equilibrium?

No.

Problem 6 (10 points) Suppose that workers value their time anywhere between \$0/hour and \$50/hour, with every value between 0 and 50 being equally likely. A worker will take a job only if the wage is above the value of his time. Suppose that if a worker takes a job, he will generate revenue equal to 1.5 times the amount he values his time (that is, a worker who values his time at \$20/hour will generate $\$20 * 1.5 = \$30$ revenue for a firm each hour). Firms cannot how productive workers are before hiring them; all workers look identical.

a. Is there an equilibrium in which all workers are hired? If so, describe it (what wages are paid, which workers work). If not,

No; if all workers were to be hired, the max wage a firm would be willing to pay is \$37.50, but the best workers will not work at this wage. Similar to the used car example from the lecture of Tuesday, October 11, this market will completely unravel, and no workers will work for firms.

b. What is the name for this economic phenomenon studied in this question?

Adverse selection or market collapse.

c. Suppose workers become more productive, so that now when a worker is hired, he increases a firm's revenue by X times the amount he values his time (that is, a worker who values his time at \$20/hour will generate $\$20 * X$ dollars for a firm each hour). Would you get a different answer to part a if X were much larger? Explain why.

Yes, you would get a different answer. Suppose all workers work. Then, a firm is willing to pay a wage no higher than average productivity, which is $25X$. So, as long as $X > 2$, there is an equilibrium in which all workers work, and adverse selection is not a problem.