MBA 405B

Midterm Exam

Name:_____

SSN:_____

Section: Morning ☐ Afternoon ☐

You have two hours to complete this six-question exam. This is worth 30% of your final grade and contains a total of 120 points. Good luck.

1. (20) Find the Nash equilibria, if any, of the following game. If there are Nash equilibria, are any of them also dominant strategy equilibrium?

		Player 2	
		Left	Right
Player 1	Top	30 -2	35 -1
	Bottom	4 -1	10 -5

Top-Right is the Nash equilibrium.

Although Right is dominant strategy for player 2, Top is not a dominant strategy for player 1. Thus, there is no DSE.

2. (20) In the game below, identify the following:

a. Nash equilibria, if any: **B-Left, B-Right**

b. Dominant strategy equilibria, if any: **No dominant strategy for player 1. Right is a weakly dominant strategy for player 2. Thus, no DSE**

c. Dominated strategies, if any: **A, C and D are dominated strategies for player 1. Left and Middle are dominated strategies for player 2.**

		Player 2		
Player 1		Left	Middle	Right
	Strategy A	25 34	4 -3	34 5
	Strategy B	34 122	18 7	34 87
	Strategy C	20 1	24 3	30 49
	Strategy D	3 33	78 22	89 12
	Strategy E	89 89	1 58	90 28

3. (20) What is a warning and what is a threat in the context of strategic situations?

Threat: A threat is a response rule to punish others who fail to cooperate with you.

Warnings: A warning is the act of *informing* your opponents of the punishment they will suffer if they don't cooperate.

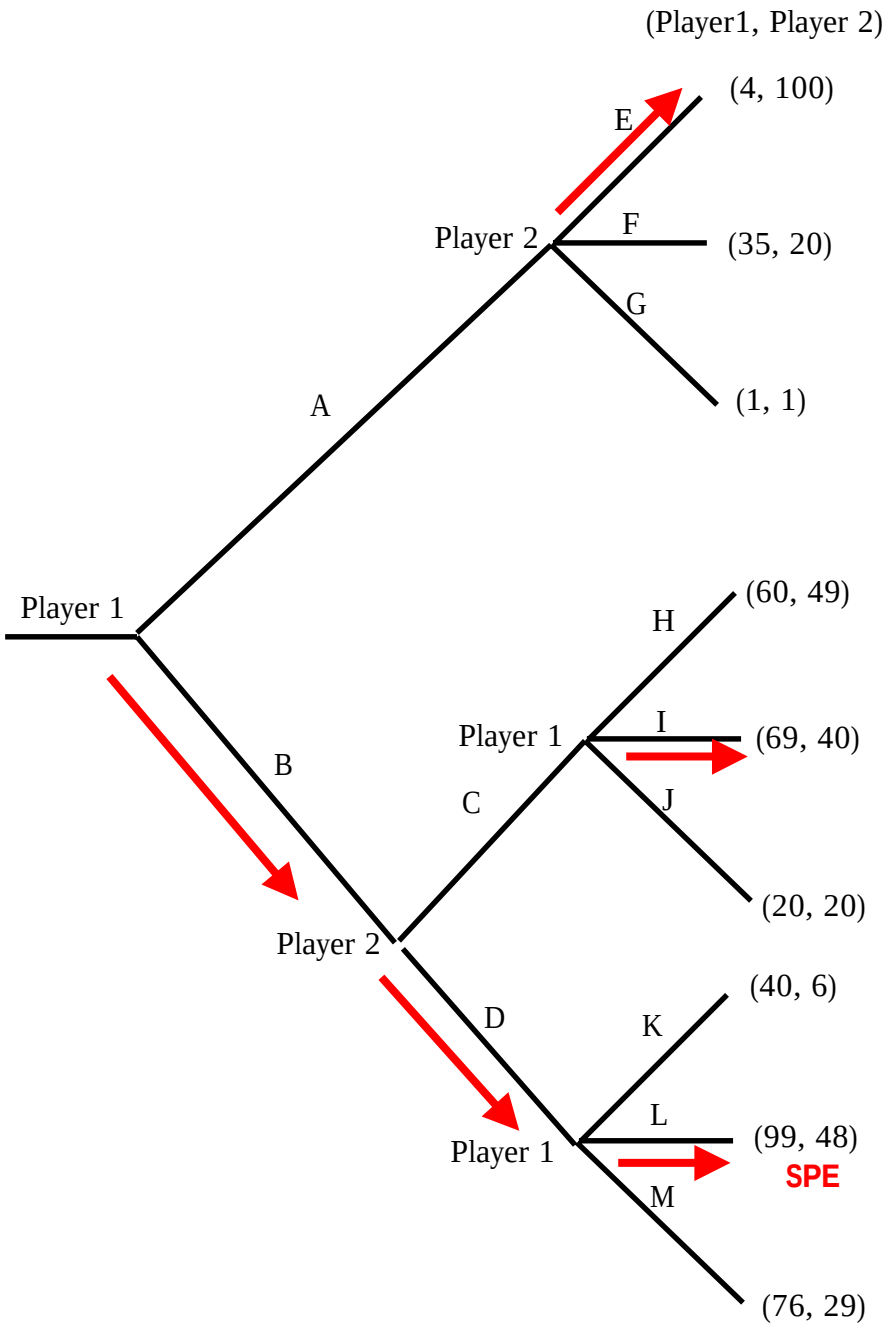
4. (20) Consider a prisoner's dilemma with side-payments that is played repeatedly. Suppose there is a probability P that any given period will be the last period of play. In general, there are many potential Nash equilibrium involving different divisions of the surplus. These might favor either player or might be more equitable. (Recall the folk theorem.) However, as P increases, the set of potential equilibria changes. Explain what happens to the set of equilibrium as P increases (for example, what divisions of the surplus are added or subtracted to the set of Nash equilibria as P increases). Give an intuitive explanation for why the equilibrium set changes this way.

For P that close enough to zero, any set of strategies that give each agent strictly more payoff than they get in the Nash equilibrium of the one-shot game (call these the "noncooperative payoffs") can be supported as a Nash equilibrium of the repeated game.

As P increases, the chances that the game will continue to next period go up. Thus, expected value of future cooperation goes up (all else equal) and the temptation to take the one time payoff from defection decreases. Therefore, as P increases, more divisions of the surplus are added to the set of equilibria. As P gets close enough to one, any division of surplus that gives each player strictly more than the noncooperative payoff will become equilibrium of the game.

To put this another way, as P decreases from one (the one shot game) and gets small enough, the equilibrium set expands to include the possibility of cooperation and equal division of the surplus. As P continues to decrease and approaches zero, the set of equilibria expands ever further and includes many unequal divisions of the surplus as well. Eventually, almost everything that gives payoffs bigger than the disagreement payoffs become Nash equilibria of the repeated game.

5. (20) Consider the sequential game below. Using the rule of "look forward and reason backward", also called backwards induction, find the subgame perfect equilibrium. Briefly explain your reasoning.



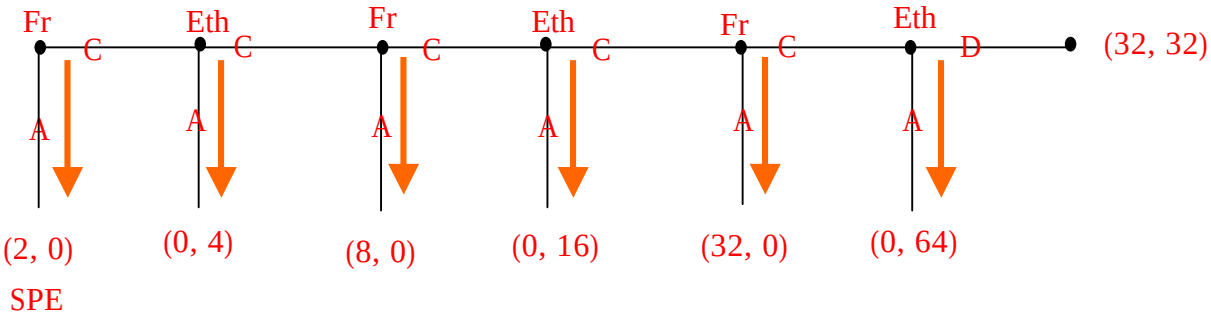
6. (20) Fred Cardshark develops a new system of counting cards that is foolproof. Counting cards is considered cheating, so Fred does not want to use it too often for fear that the casinos will catch him and turn him over to the police for prosecution. Fred therefore decides to partner with Ethel Scamartist to help run his system. Here are the details of his plan.

A. The system is so good that each time they use it, they know they will be able to exactly double their money at the card tables. They start with $1000.
B. Fred and Ethel will alternate going into the casino each day lessen the odds of being caught. Thus, Fred takes the money to the casino on the first day, then Ethel bets the next day, then Fred and so on.
C. They can use the system exactly six times. Playing more than this will result in the casino catching on and taking away all their winnings.
D. Whoever is going to be doing the betting on any given day will take all of the winnings they have made up to that point with him or her to bet. Thus, they bet $1000 the first day, $2000 the next day and so on.
E. The current player can either take the day's winnings and give them to his partner to bet with the next day (continue), or cheat his partner and take the current winnings and run away (abscond). On the last day, there is one additional strategy available. The partner who bets may choose to divide the winnings 50/50 with the other partner (divide).

The game is played sequentially. Thus, Fred bets the initial stake of $1000 on day one, then chooses to either continue or abscond. If he absconds he gets all the winnings, Ethel gets nothing and the game is over. If he chooses to continue, the game goes to round two and it is Ethel's turn to take the winning, double the money, and then to choose either to continue or abscond.

Draw this sequential game in the form of a tree. By looking forward and reasoning back, solve for the equilibrium.

(Extra space for answer)



This is the so-called "centipede game". Suppose they get to the last period and Ethel has $64,000 in her pocket. If she "divides" she gets 32, if she "absconds", she gets 64. Thus, she absconds. Knowing this, Fred realizes in the fifth period, that if he "continues", he gets nothing. If he "absconds", he gets 32. Thus, he absconds. This reasoning continues back to the first period. Thus, the SPE is for Fred to "abscond" with 2 in the first period.