

Midterm exam PS 30 May 2003

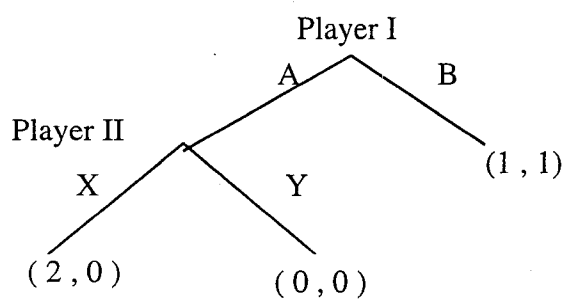
This is a closed book exam. The only thing you can take into this exam is yourself and writing instruments. Everything you write should be your own work. Those involved in academic dishonesty will be summarily given a grade of F for the course; I will also write a letter recommending expulsion. Partial credit will be given: math mistakes will not jeopardize your grade. There are four sections of this exam. Each section is weighted equally, and each problem in each section has equal weight in that section. Please show all steps of your work and explain what you are doing at each step. Correct answers alone are worth nothing without a clear and correct explanation of where the answers come from. Clarity and legibility are factors in the grade.

Do not write on this question sheet—write on the blank paper provided. Number each page like this: "page 1 of 5," "page 2 of 5," and so forth (if you have 5 total pages for example). Write only on the front of each page. Make sure that your complete name is on each page. Start each section on a new page, because we might separate the exams when we grade them. When the exam is over, if you continue to write on your exam in any manner (including writing your name, page numbers, etc.) your exam will not be accepted. Staple your pages together when you turn them in and write your name down on the log. If you have a question, raise your hand and hold up the number of fingers which corresponds to the section you have questions about (if you have a question on Section II, hold up two fingers). Good luck!

Part I.

	2a	2b
1a	1, 1	100, 0
1b	0, 100	100, 100

- Find all pure strategy Nash equilibria.
- Make a prediction by iteratively eliminating weakly dominated strategies.
- How does this game illustrate that eliminating weakly dominated strategies is not always "safe"?



- Represent this extensive form game as a strategic form game.
- Find all pure strategy Nash equilibria.
- Find all subgame perfect Nash equilibria.

Part II.

Both Bob and Alex are considering purchasing Sally's car. Each one of them can make one of only three offers, \$200, \$600 or \$1000, and Sally can only accept or decline the offer.

a. Assume that the car is worth \$500 to Sally, but it is worth \$1000 to Bob and Alex. Sally would not sell the car for under \$500. She would sell the car to the highest bidder. If both Bob and Alex offer the same amount, Sally would sell the car to her favorite-- Alex. Present the game in strategic form (assume people move simultaneously) and solve for all Pure Strategy and Mixed Strategy Nash Equilibria.

b. Assume that the game changes. Bob makes an offer first. If Sally declines Bob's offer, Alex will have the opportunity to make an offer, Once again, each of them can only offer \$200, \$600 or \$1,000. Sally can only accept or decline the offer -- she can do nothing else -- then the game is over. Draw the game tree, labeling moves and putting in payoffs, then find all Subgame Perfect Nash Equilibria.

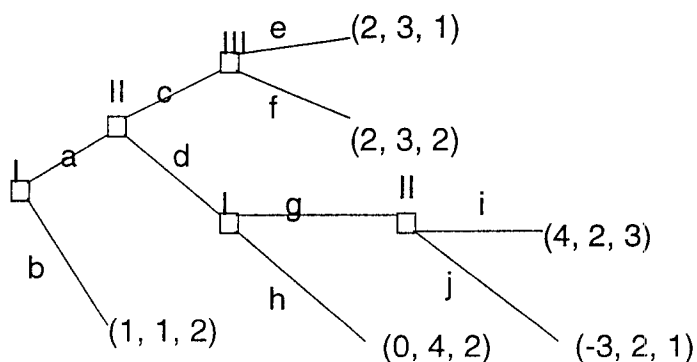
Part III.

Assume that Steve was elected as the president of the student body for PS30 class at the beginning of the quarter. It is time to hold a midterm election and Michelle decides to challenge him. In the campaign, each has to choose between focusing on issues or on personalities. Steve's approval rating in the class is 51% and this ensures that if both choose the same strategy Steve wins. Michelle's only way to win is to make a sufficiently better impression in her campaign by choosing a different strategy from Steve. When Steve wins on issues his payoff is 4 and his payoff is 1 when he wins on personalities. In this zero-sum game, if Michelle wins by choosing to focus on issues, her winning payoff is one unit less than Steve's payoff when he wins by focusing on issues. This lower payoff results from the disadvantage of being a challenger. However, if she wins by choosing to focus on personalities, she gets an additional unit than Steve's payoff when he wins by focusing on personalities. The additional gain results from Michelle's negative campaign that exposes Steve's character of being a bad student.

- a. Say that Michelle and Steve pick their campaign strategies simultaneously. Find all Nash equilibria of this game.
- b. Now say that Michelle picks her campaign strategy after Steve (because Steve is the incumbent). Find all Nash equilibria and subgame perfect Nash equilibria of this game.
- c. Which scenario above does Michelle prefer: moving simultaneously (a.) or moving sequentially (b.)? Why?

Part IV.

For the below game, answer the following questions



Payoffs are: (I's payoff, II's payoff, III's payoff)

- Show all subgame perfect equilibria by using backwards induction.
- List all strategies for each player.
- Represent the above extensive form game as a strategic form game.
- Find all pure strategy Nash equilibria. Find which pure strategy Nash equilibria are subgame perfect.