ECON 251: Intermediate Microeconomics
Department of Economics, Lafayette College Spring 2024
Instructor: Prof. Sayorn Chin (he/him/his)

Problem Set 9

Due: 1 May (Physical Copy in Class)

Instruction

Work in teams of 2-3 people, provide your responses typed in LaTeX. Handwritten submissions will not be accepted. The primary purpose of the problem sets is to give you experience thinking and working through economic problems. Getting the right answer is much less important than understanding the right answer and how it was derived. Accordingly, problem sets are graded on a combination of effort and accuracy. Your investment or lack of investment in these assignments will determine your success in the course as problem set investment is strongly correlated with exam performance.

1. (4 points) Consider the game of chicken with two players. If both players play "Macho," each of them gets a payoff of 0. If both players play "Chicken," each of them gets a payoff of 6. If one player plays "Macho" and the other plays "Chicken," the one who plays "Macho" gets a payoff of 7 and the one who plays "Chicken" gets a payoff of 2.
    a. (2 points) Draw the payoff matrix.
    b. (1 point) Does either player have a dominant strategy in this game? Explain.
    c. (1 point) Find the Nash equilibrium or equilibria. Explain.
2. (5 points) Jack and Jill want a treehouse to play in. They have to decide simultaneously whether to build or not to build. Each individual who builds bears a cost of 3. They both have access to the treehouse once it is built. If only one of them builds the treehouse, they each derive a utility of 2. If both of them build the treehouse, they each derive a uility of 4 (presumably the treehouse is more elaborate because two heads are better than one). If the treehouse is not build, they each derive a utility of 0.
    a. (2 points) Draw the payoff matrix.
    b. (2 points) What is Jack's strategy? What is Jill's strategy? What is the Nash equilibrium or equilibria?
    c. (1 point) Does this game resemble the prisoners' dilemma, the battle of the sexes, or chicken? Explain.

3. (8 points) Consider the following payoff matrix:

		Column: Cooperate	Column: Defect
Row	Cooperate	$10, 10$	$0, 14$
	Defect	$14, 0$	$2, 2$

   a. (2 points) Suppose that Row and Column are completely self-interested and interact in a one-shot game.
      i. What strategy would you expect each player to play? Why?
      ii. Is this a social dilemma?
   b. (3 points) Suppose that both Row and Column are somewhat altruistic, so each \$1 received by the other player is worth \$0.50 to them.
      i. Rewrite the payoffs matrix to account for the players' social preferences.
      ii. What strategy would you expect each player to play? Why?
      iii. Can social preferences resolve the prisoners' dilemma?
   c. (3 points) Return to the original assumption that Row and Column are completely selfish and that they play a one-shot game. However, now assume that the government fines Defectors \$5.
      i. Rewrite the payoffs matrix to account for the government's punishment of Defectors.
      ii. What strategy would you expect each player to play? Why?
      iii. Can institutions resolve the prisoners' dilemma?

4. (3 points) Consider the following payoff matrix:

		Player 2: L	Player 2: R
Player 1	U	$2, -3$	$1, 2$
	D	$1, 1$	$4, -1$

   Let p be the probability of Player 1 playing U and q be the probability of Player 2 playing L at mixed strategy Nash equilibrium.

   a. (2 points) Find the mixed strategy Nash equilibrium.
   b. (1 point) Find the mixed Nash equilibrium payoffs.