Spring 2024 WRITE YOUR NAME ON THE BACK ONLY

#### Game Theory

ECON 3208

##### Midterm Examination

This exam has four questions of which you need to answer three, worth 20 points each (60 points total). There is also an extra credit section. Note that, if you have time, you may attempt all of the questions. All of them will be graded and the best three will be counted.

Please identify any assumptions you are using in your analysis and show all work for partial credit.

You may use the back of a page if necessary, but clearly indicate if you do so that I will know to look there. Work quickly if you wish to answer every question, but carefully.

Question 1.

Consider the following strategic-form simultaneous game. Player 1’s payoffs are listed first, in bold.

|  |  |  |
| --- | --- | --- |
|  |  | Player 2 |
|  |  | X | Y | Z |
| **Player 1** | **A** | **60** , 40 | **90** , 50 | **1** , 80 |
| **B** | **90** , 0 | **50** , 50 | **2** , 80 |
| **C** | **80** , 60 | **90** , 0 | **4** , 80 |

1. [3 pts] Does either player have any *strictly dominant* strategies?

If yes, list it/them. If no, briefly explain why not.

1. [3 pts] Does either player have any *strictly dominated* strategies? List them if yes. Briefly explain.
2. [3 pts] Does either player have any *weakly dominated* strategies? List them if yes. Briefly explain.
3. [6 pts] List all pure-strategy Nash equilibria of the above game.
4. [3 pts] Can a *weakly dominated* strategy ever be a best response? If yes, provide an example.

If no, briefly explain why not.

1. [2 pts] Could *refinements* be useful in the above game? Briefly explain why or why not.

Question 2.

Consider the following game:

|  |  |  |
| --- | --- | --- |
|  |  | P 2 |
|  |  | X | Y |
|  **P 1** | **A** |  **20** , 10 | **20** , 0 |
| **B** |  **50** , 10 |  **0** , 100 |

1. [2 pts] Does the game pictured above have a Nash equilibrium?
2. [10 pts] In the game above, what is Player 2’s equilibrium strategy?
3. [4 pts] If the “20” in the top right box increased slightly (but everything else stayed the same), how would Player 1’s equilibrium strategy change? Explain. [Calculations are not necessary.]
4. [2 pts] If the “20” in the top right box increased slightly (but everything else stayed the same), how would Player 2’s equilibrium payoff change? Explain. [Calculations are not necessary.]

1. [2 pts] An online reading discussed data from penalty kicks in professional soccer. Soccer players tend to kick to the left side of the goal about 40% of the time and to the right side of the goal about 60% of the time. When kicking to the left, soccer players score a goal 80% of the time. How often do they score a goal when kicking to the right? Briefly explain.

Question 3.

Consider the following game. Player 1’s payoffs are listed first, in bold:

|  |  |  |
| --- | --- | --- |
|  |  |  Player 2 |
|  |  | X | Y |
| **Player 1** | **U** |  **20** , 5 |  **40** , 3 |
| **M** |  **0** , 0  |   **30** , 3 |
| **D** |  **1** , 3 |   **10** , 3 |

1. [2 pts] Write down all pure-strategy Nash equilibrium/equilibria of the above game.
2. [13 pts] Imagine that Player 1 makes a decision first and Player 2 makes a decision after observing Player 1’s choice. Write down every subgame-perfect Nash equilibrium of this game.
3. [2 pts] If Player 2 had a choice between playing the above game

(i) simultaneously,

(ii) sequentially with Player 1 going first and Player 2 making a decision second (as in b), or (iii) sequentially with Player 2 going first and Player 1 making a decision second,

which would Player 2 choose? Carefully explain.

1. [3 pts] What does “simultaneous” mean in game theory?

Question 4

1. [5 pts] “*Game theory’s assumptions are idiotic. People don’t think ‘rationally’—they don’t devote hours to mathematically calculating the outcomes of every decision in their lives*.” Explain why this quote misinterprets the meaning of the “rationality” assumption in game theory.
2. [5 pts] What does it mean for payoffs in a game to be “common knowledge”?
3. [5 pts] Find **all** values of X and Y for which the game below has at least one Nash equilibrium.

|  |  |  |
| --- | --- | --- |
|  |  | P 2 |
|  |  | C | D |
|  **P 1** | **A** |  **9** , 10 | **3** , 11 |
| **B** | **12** , 2 | **X** , Y |

1. [5 pts] FairVote is an organization fighting to switch America’s election system from plurality (who gets the most votes) to a system called **ranked choice**, where voters rank all of the alternatives instead of having to pick just one. FairVote argues: “Our current system incentivizes us to choose between voting for the candidate you love or the candidate who maybe has a better chance of winning? With ranked-choice voting, your best strategy is to express your honest preferences.” Do you agree or disagree with this statement? Briefly explain.