Econ 327: Game Theory
Homework #1

University of Oregon

Due: Oct. 11th

Question:	**Question 1**	**Question 2**	**Question 3**	Total
Points:	28	32	28	88
Score:				

For homework assignments:

- Complete *all* questions and parts.

- You may choose to work with others, but everyone must submit to Canvas individually. Please include the names of everyone who you worked with below your own name.

Name _____

Question 1. **Multiple Choice**

    (a) [4 points] Which of the following is **not** an example of **strategic behavior**?

          A. I always choose Chocolate over Vanilla ice cream because I like it better

          B. More people bike on days with too much traffic

          C. Apple markets *Pro* versions of their products to people with money and non-Pro versions to broke students

          D. Best Buy offer to match any competitors price offer for their customers

    (b) [4 points] **A**lice, **B**ob, and **C**onfucious each put one dollar in a pot and each toss a fair coin. **A**lice wins if the coins are *all heads* **or** *all tails*, **B**ob wins if there are *2 heads* and *1 tail*, and **C**onfucious wins if there are *1 head* and *2 tails*.

        What are the **expected payoffs** for each player? [1]

          A. $EU_A = \$0$, $EU_B = \$0$, $EU_C = \$0$

          B. $EU_A = -\$0.25$, $EU_B = \$0.125$, $EU_C = \$0.125$

          C. $EU_A = -\$0.50$, $EU_B = \$0.25$, $EU_C = \$0.25$

          D. $EU_A = \$0.50$, $EU_B = -\$0.25$, $EU_C = -\$0.25$

   (c) [4 points] Consider the game tree below
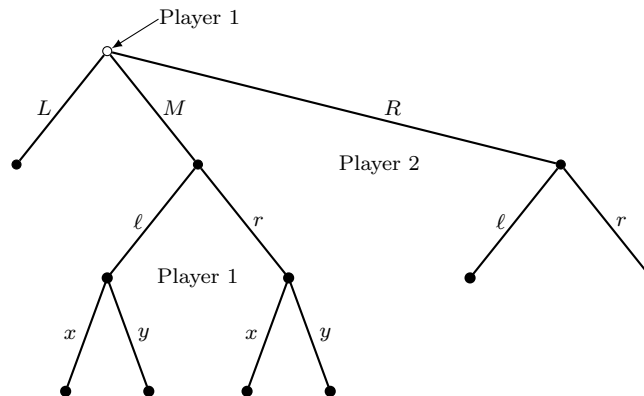
        (recall that a strategy is a complete plan of action for *every* eventuality)

        Which of the following is a **complete strategy for Player 1**?

          A. (L)

          B. $(x$ if $\ell)$

          C. $(L, x$ if ℓ, y if $r)$

          D. (R)

    (d) [4 points] Consider the game tree from the previous question.

        Which of the following is a **complete strategy for Player 2**?

          A. $(\ell$ if $M)$

          B. $(r$ if M, ℓ if $R)$

          C. (ℓ)

          D. $(\ell$ if L, r if M, r if $R)$

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[1] Adapted from Dixit, Skeath, & McAdams (2021)

(e) [4 points] Consider the game tree below Find the **rollback equilibrium**.
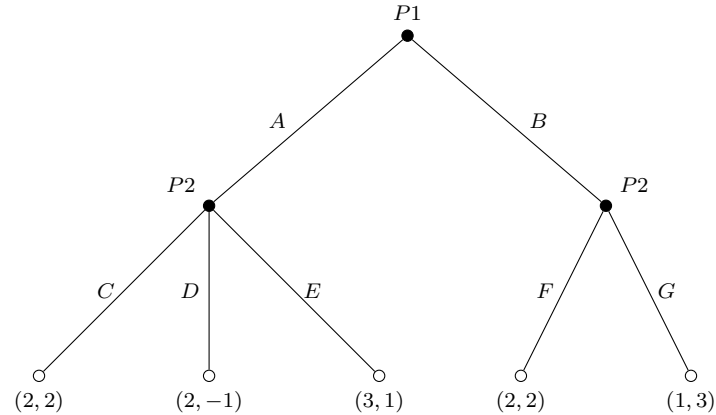
A. **P1:** (A), **P2:** $(C$ if A, F if $B)$
B. **P1:** (A), **P2:** $(C$ if A, G if $B)$
C. **P1:** (B), **P2:** $(C$ if A, F if $B)$
D. **P1:** (B), **P2:** $(D$ if A, G if $B)$

(f) [4 points] Consider the following variation to the Survivor Flags game:

There are 100 flags to start with, two teams who take turns taking flags, each team can take any number of flags between 1 and 10 on their turn, and the team to take the last flag wins.

How many flags should the first team take?

A. 1
B. 2
C. 5
D. 10

(g) [4 points] **Rationality** means that:

A. Players have perfect information
B. Players never make mistakes
C. Players have perfect recall
D. Preferences are complete and transitive

Question 2. Imagine a sequential moves version of rock-paper-scissors where player 2 gets to pick what they will do after player 1 picks. Please model the game in its extensive form (as a game tree). Assume both player 1 and player 2 only care about the result of the game and have the following preferences over the result of the game: win $\succ$ tie $\succ$ loss. [2]

    (a) Answer the following questions:

        i. [4 points] How many nodes are there?

        ii. [4 points] How many branches are there?

        iii. [4 points] How many terminal nodes are there?

    (b) [10 points] Prune the tree as much as possible. How many branches were you able to eliminate? (A complete answer should include your drawing(s) of the game tree)

    (c) [10 points] Use the same setup, but now imagine player 1's preferences change because they want to be seen as a "tough guy". Given that what they want to play remains the same, they still have the following preferences over the result of the game: win $\succ$ tie $\succ$ loss. However, they now would prefer to lose playing rock than win playing paper or scissors. Please create a new game tree so the payoffs reflect these new preferences.

    Prune the tree as much as possible.

    How many branches were you able to eliminate? (Include your drawing(s))

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[2] Ethan Holdahl, University of Oregon

Question 3. Read the 2022 Policito Opinion article, *How Game Theory Explains Why We Have to Sanction Putin : Even If It's Costly.*

https://www.politico.com/news/magazine/2022/04/21/russia-sanctions-game-theory-00026566

 (a) [8 points] List the tools from game theory that we've learned about in class which the authors use to argue their point.

 (b) [10 points] What assumptions do they make in their simplified model of international sanctions?

 (c) [10 points] Choose one assumption of the author's model to change and explain how it changes what the model predicts.