

Eco 311/511: Game Theory

Problem Set 1

August 26, 2024

1. Which of the following binary relations are preference relations?
 - (a) \geq : “greater than or equal to” defined on the set of real numbers, R .
 - (b) “is a next door neighbour of”: defined on a set of all individuals living in houses on a street.
 - (c) \succeq : defined on R^2 as follows: for any $(a_1, a_2), (b_1, b_2) \in R^2$,

$$(a_1, a_2) \succeq (b_1, b_2) \iff a_1 > b_1 \text{ and } b_1 \geq b_2$$

2. Suppose two animals are fighting over a prey. Each animal can be passive or aggressive. Each prefers to be aggressive if the opponent is passive, and passive if the opponent is aggressive. Given its own stance, it prefers the outcome in which its opponent is passive to that in which its opponent is aggressive. Formulate this situation as a strategic game and find its Nash equilibria.
3. Write down the expected utility for the players in a two player matching pennies game if each of them believes that the other player will say Heads with probability 0.3 and Tails with probability 0.7.
4. Find pure strategy Nash equilibria for the following two player simultaneous move game:

Player 2

		A	B
Player 1	A	(4,4)	(4,2)
	B	(2,4)	(6,6)

5. Write down a Prisoner’s Dilemma game. Instead of the standard assumption, suppose that each player wants to minimize her own payoff, and each player believes that the other player is also doing the same. What will be the Pure Strategy Nash equilibria in this case? Show your calculations/write down your reasoning.

6. Two investors are involved in a competition with a prize of 100. Each investor can spend any amount in the interval $[0, 100]$. The winner is the investor who spends the most; in the event of a tie each investor receives 50. Formulate this situation as a strategic game. Write down the best response function/correspondence for the players (investors). Does the game have any pure strategy Nash equilibria? Provide an explanation for your answer.