

Problem Set 1 – Refresher on Utility Maximization

Ec 4310, Prof. Moore

Due: 11:59pm, 9/10/2025

Please turn in a single copy of the problem set on Canvas. Each of you must independently write your own solutions to the homework. You should feel free to discuss the questions with each other, with me, or with our graduate AIs. However, the work you produce must, in the end, represent your own thoughts and understanding of the problems. In particular, it would not be appropriate to study someone else's answer to a problem and reproduce it as your own.

1. Consider the set of alternatives $X = \{x, y, z\}$. A binary relation R on X is a set of ordered pairs from X . If $(a, b) \in R$, we write aRb and read “ a is related to b ”. In the case of preferences, this means “ a is at least as good as b ”.
 - a. (2 points) Provide an example of a binary relations on X that is complete and reflexive, but not transitive.
 - b. (2 points) Provide an example of a binary relation on X that is reflexive and transitive, but not complete.
2. (3 points) Provide give an example from your life or experience where either the axiom of transitivity or completeness have been violated with respect to your preferences.
3. Suppose a decision maker chooses $\{\text{cherries}\}$ from the set $\{\text{apples}, \text{bananas}, \text{cherries}\}$.
 - a. (2 points) The next day they choose from $\{\text{bananas}, \text{cherries}\}$. What, precisely, is required of their choice in order for the choice data to satisfy Property A (IIA)?
 - b. (2 points) On the third day they choose from $\{\text{apples}, \text{bananas}\}$. What, precisely, is required of this choice in order for the choice data to satisfy Property A (IIA)?
4. Suppose a decision maker chooses $\{\text{bananas}, \text{cherries}\}$ from the set $\{\text{bananas}, \text{cherries}\}$, and chooses $\{\text{cherries}\}$ from the set $\{\text{apples}, \text{bananas}, \text{cherries}\}$.
 - a. (2 points) Does this data satisfy Property B? Why or why not?
 - b. (2 points) Does this data satisfy Property A (IIA)? Why or why not?

5. Suppose a decision maker produces choice data in which a single alternative is chosen from every menu.
 - a. (2 points) Does this data necessarily satisfy Property A (IIA)? Why or why not?
 - b. (2 points) Does this data necessarily satisfy Property B? Why or why not?
6. (3 points) Provide give an example from your life or experience where Property A (IIA) or Property B has been violated with respect to your choices.
7. (3 points) Now that we have formally defined what it means to be a rational decision maker, do you think your choice on whether to sit in the computer section or not was rational?