30418 Computational Microeconomics-1
Mock 1st Partial

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This version: September 21, 2023

INSTRUCTIONS:

- This is a closed book exam. You are not allowed to consult books, lecture notes, or your own notes. Also, electronic devices, such as computers, calculators, cellphones etc., are not allowed.
- This closed book exam begins at 14:00 and ends at 15:30.
- You have 1.5 hours (that is, 90 minutes). The number of points for each question is suggestive of the time in minutes to be spent on it. Unless otherwise stated, points are uniformly allocated to the different parts of a question.
- Your grade (from 1 to 31) will be an increasing function of your score (from 1 to 90), but it need not be proportional to your score (you may get 31 even with a score below 90).
- Write clearly. Make explicit the steps of your arguments. Define any non-standard symbols you use. Subject to these constraints, do not waste your time and your grader's time writing very long answers.

1 Definitions (15 points)

Define the following terms using, if necessary, formulas.

a) Preference relation.

b) Weak axiom of revealed preference.

c) Arrow-Pratt coefficient of absolute risk aversion.

2 Preferences and Utility (15 points)

Let X be a nonempty *finite* set and let $\succcurlyeq$ be a preference relation on X . By Lemma 1-1, we know that at least one member of X is minimal with respect to $\succcurlyeq$ in X. Show that $\succcurlyeq$ can be represented by a utility function.

3 Risk (20 points)

An individual has wealth w and is afraid that an accident will occur with probability p that will cause him a loss of D. The individual has to choose an amount, x, he will pay for insurance that will pay him λx (for some given λ) if the accident occurs.

a) The insurer's expected profit is $x - \lambda px$. Assume that λ makes this profit zero, so that $\lambda = 1/p$. Show that if the individual is risk-averse he optimally chooses $x = pD$, so that he is fully insured: his net wealth is the same whether or not he has an accident.

b) Assume that $p\lambda < 1$ (that is, the insurer's expected profit is positive). Show that if the individual is strictly risk-averse and an expected utility maximizer then he chooses partial insurance: $\lambda x < D$.

4 Consumer Preferences (20 points)

Consider a binary relation $\succcurlyeq$ on $\mathbb{R}^2_{++}$ defined by

$$x \succcurlyeq y \Leftrightarrow \max\{x_1, x_2\} \geq \max\{y_1, y_2\} \text{ and } x_1 + x_2 \geq y_1 + y_2.$$

a) What are $\succ$ and $\sim$?

b) Is this binary relation complete? transitive?

c) Is this binary relation strictly monotone?

d) Is this binary relation convex?

5 Competitive Equilibrium (20 points)

Consider the following exchange economy in which $N = \{A, B\}, u_A = x_1 x_2, u_B = x_1^2 x_2, e_A = (2, 3), e_B = (5, 4)$.

a) Suppose the price vector is $(p_1 > 0, 1)$. What is the demand function of individual A?

b) What is the demand function of individual B?

c) What is the competitive equilibrium?

d) Is the competitive equilibrium allocation Pareto optimal?