

Cooperative Ph.D. Program in the School of Economic Sciences and Finance

QUALIFYING EXAMINATION IN MICROECONOMICS

**August 7, 2025
8:45 a.m. to 1:00 p.m.**

THERE ARE FOUR QUESTIONS –YOU MUST ANSWER ALL **FOUR** QUESTIONS.

- ❁ You **must** complete the examination within four hours. You will have 15 minutes to read over the questions before starting (8:45-9:00).
- ❁ This exam is closed book. Calculators and paper will be provided.
- ❁ Read the question carefully. Allocate your time carefully. Parts within questions will often vary in difficulty and weight. Be sure to do all parts of each question chosen.
- ❁ If necessary, it is permissible to make clarifying assumptions, but be sure to label them explicitly. (Grades will not take unstated assumptions for granted.) Also, label graphs and define notation.
- ❁ Number your answer sheets consecutively. Begin your answer to each question on a new page and identify the questions number.
- ❁ Leave ½-1” spacing around the edges of your paper.

Please write your exam ID number on the top of this page.

Microeconomic Theory Comprehensive Exam - August 2025

Instructions:

- This exam has four (4) exercises.
- You must answer all exercises.
- Please read all exercises carefully.
- Answer each exercise in a formal and concise manner, but include all your steps. This will allow you to obtain partial credit.

Good luck!!

1. **Andreoni and Miller preferences.** Consider the following utility function

$$u_i(x_i, x_j) = [\alpha x_i^\rho + (1 - \alpha) x_j^\rho]^{\frac{1}{\rho}}$$

where x_i and x_j are the monetary payoffs of individuals i and j , respectively. Parameter $\alpha \in (0, 1)$ captures how much individual i cares about his own payoff. When $\alpha = 1$, the above utility function collapses to $u_i(x_i, x_j) = x_i$, meaning that individuals are completely selfish; when $\alpha = 0$, the utility function simplifies to $u_i(x_i, x_j) = x_j$, implying that individuals are completely altruistic.

- (a) Is this utility function homogeneous? If yes, of what degree?
- (b) Find the marginal rate of substitution between individual i and j 's payoffs, MRS_{ij} .
- (c) Find the slope of the indifference curve. Show that is negative for all admissible parameters.
- (d) Is the slope of the indifference curve that you found in part (c) increasing, decreasing, or constant in x_i ? Interpret your results in terms of concave, convex, or linear preferences, respectively.

2. **Public good.** Consider the contribution to a public good of two individuals, A and B . They must decide the amount of their contributions q_i where $i = \{A, B\}$. Individual i 's utility function is

$$u_i(x_i, Q) = x_i \sqrt{Q}$$

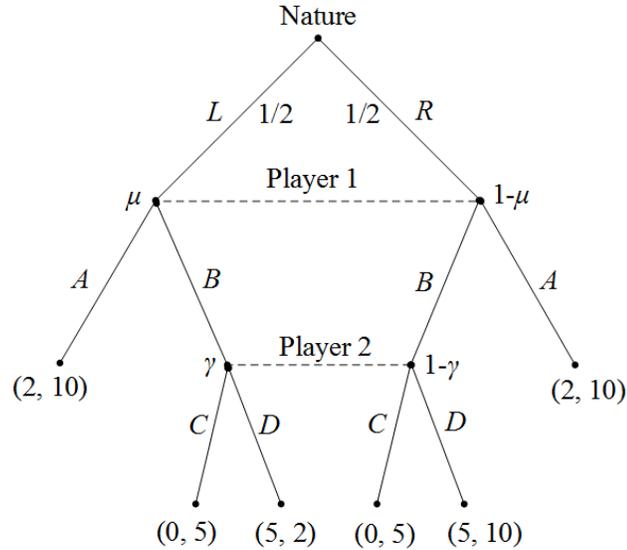
where x_i denotes units of the private good and $Q = q_A + q_B$ is the aggregate contribution to the public good. Assume that the price of the private and public good is 1, and that individual i 's income is $m_i \geq 0$.

- (a) Find the equilibrium individual and aggregate contributions.
- (b) Find the socially optimal donation. Compare your result with those in part (a). [*Hint*: After taking first-order conditions, assume symmetry in contributions].
- (c) Consider an income tax on individual B that is entirely distributed to individual A as a positive transfer (revenue neutral policy). Show that aggregate donations to the public good are unaffected by this income redistribution.

3. **Collusion and audits.** Consider two firms selling a homogenous product, and competing in price (à la Bertrand). Firms face a linear demand function $Q(p) = 1 - p$, where $Q = q_1 + q_2$ denotes aggregate output and p represents price. Firms are symmetric in their marginal production cost, c , which we normalize to $c = 0$. Firms interact in an infinitely-repeated game and have a symmetric discount factor $\delta \in [0, 1]$.

- (a) *No competition authority.* As a benchmark, let us first consider a setting without a competition authority monitoring collusion. In this context, find the minimal discount factor supporting collusion, denoting it as $\bar{\delta}$.
- (b) *Audits.* Assume now that the competition authority (CA) monitors collusion in every period with probability $\alpha \in [0, 1]$, i.e., random audits. If the CA detects collusion, every firm receives a fine $F > 0$ in the current period and firms can no longer collude in future periods. Find the minimal discount factor that sustains collusion in this context, denoting it as $\bar{\delta}_A$. Compare $\bar{\delta}_A$ and $\bar{\delta}$. Interpret your results. (For simplicity, you may assume that the fine F satisfies $F < \frac{1}{8\alpha}$ for the rest of the exercise.)
- (c) *Comparative statics.* How is the discount factor that you found in part (b), $\bar{\delta}_A$, affected by a marginal increase in α or F ? Interpret.

4. **PBEs when all player are uninformed.** Consider the sequential-move game in the figure below. First, nature selects L or R , both equally likely (probability is $1/2$). Second, player 1 responds choosing A or B but, unlike in standard signaling games, he cannot observe the move of nature. If player 1 responds with A , the game is over. If he chooses B , then player 2 responds with C or D , not observing the move of nature.



- Find the Bayesian Nash Equilibria (BNEs) of this game. For simplicity, consider only pure strategies.
- Argue that the BNEs found in part (a) are also Subgame Perfect Nash Equilibria (SPNEs). A short verbal explanation suffices.
- Show that all BNEs found in part (a) are also Perfect Bayesian Equilibria (PBEs). Interpret your results.
- Argue that all PBEs identified in part (c) survive Cho and Kreps' Intuitive Criterion. However, discuss that one of the PBEs is based on insensible off-the-equilibrium beliefs.