

FINAL EXAM

MICROECONOMIC THEORY II

SPRING 2018

Instructions

This exam has 10 questions worth 10 points each. You have no more than two hours to complete this exam.

Partial credit will be awarded preferentially for *incomplete* answers, as opposed to incorrect answers. Each question that you leave blank will earn you 2 points; completely incorrect answers will earn you 0 points.

To help me assign partial credit, please

- i. work neatly,
- ii. define your notation,
- iii. write your assumptions, and
- iv. describe what you are attempting to do.

Make your answers concise and answer only what is asked.

Directions

- ☐ A sheet will be circulated on which you will record your exam code next to your name. Do *not* write your name anywhere on your answers!
- ☐ Write your answers on the *front side* of the paper only.
- ☐ Label the *bottom of each page* of your answers with your *exam code* and the *page number*; i.e. if your exam code is “C”, put “C3” at the bottom of page 3 of your answers.
- ☐ When turning in your exam, place your pages *facing up in order* and *bind them* with the supplied paper-clip.

Revisions

Revisions are due on **Tuesday, March 20th, 2018 by 10:00AM**.

Revisions must be submitted electronically on Blackboard as a *.pdf file. Although I recommend that you learn how to typeset mathematics, scans of handwritten revisions are acceptable, provided that they are legible. You may scan your handwritten work for free using the department’s copier. As with your exam, label the *bottom of each page* of your revisions with your *exam code* and the *page number*; i.e. if your exam code is “C”, put “C3” at the bottom of page 3 of your revisions.

For each point lost, you can recover up to ___/10 a point. For each question missed, you must: (1) provide the correct answer to the question *with full work*, and (2) if applicable, an explanation of why your original answer was incorrect. Questions for which explanations are omitted or revisions containing errors will be awarded partial or no credit.

You may use your textbook and notes to complete your revisions. You may not consult your peers or other sources (e.g. me, the Internet) *except* for clarifications about the mathematical tools or materials in general. So, for example, asking a peer how to determine if a function is homothetic is permitted, while asking a peer to allow you to copy their answer to question 8 is prohibited.

Grade: before revisions: ____/100 + for perfect revisions: ____ = projected revised grade: ____/100 (____)
--

Please see the instructions and directions on the previous page. As a reminder, to help me assign partial credit, please: (i.) work neatly, (ii.) define your notation, (iii.) write your assumptions, and (iv.) describe what you are attempting to do. Make your answers concise and answer only what is asked.

I. Answer questions 1, 2, and 3 below.

1. Define both axioms underlying expected utility theory.
 - i. Define the continuity axiom.
 - ii. Define the independence axiom.
2. Prove that if the continuity and independence axioms hold, indifference curves in the two-dimensional simplex must be (i.) straight, and (ii.) parallel. It may help to draw graphs.
3. Suppose an agent faces a lottery with three possible outcomes, 5, 1, and 0. Faced with lotteries:

$$\begin{aligned} L_1 &= (0, 1, 0), & L'_1 &= (.1, .89, .01), \\ L_2 &= (0, .11, .89), & L'_2 &= (.10, 0, .90), \end{aligned}$$

the agent chooses $L_1 \succ L'_1$ and $L'_2 \succ L_2$.

- i. Show that this violates the independence axiom.
 - ii. Briefly discuss the practical problems posed when the independence axiom is not satisfied.
- II. Suppose that there are two price-taking consumers, indexed by $i = 1, 2$, each with quasilinear utility $\phi_i(h) + w_i$, where w_i is consumer i 's wealth, and $h \in \mathbb{R}_+$ is a negative externality generated by consumer 1 on consumer 2 so that $\phi'_1 > 0$, $\phi'_2 < 0$, and $\phi''_i < 0$ for $i = 1, 2$.

4. Suppose that no rights over the externality are assigned. Prove that in competitive equilibrium, production of the externality will exceed the Pareto optimal amount.
5. Suppose that consumer 2 gains the right to eliminate the externality, requiring that consumer 2 agree to compensation at price p_h from consumer 1 for any $h > 0$. Find the competitive equilibrium price of h , p_h^* .

III. Suppose that two potential firm locations lie on opposite ends of a line segment of length 1 occupied by a continuum of M uniformly distributed consumers, each at a location indexed by $z \in (0, 1)$ and demanding at most one unit each of a good that could be produced by one or more firms at a constant unit cost $c > 0$. Supposing firm j were operating in either location, the net benefit to a consumer buying from that firm would be $v - (p_j + t \cdot d)$, where v is the consumer's value, p_j is the price paid to the firm, t , is the cost of travel, and d is the distance from the firm on the line segment.

6. Suppose that a single firm lies on one end of the line segment, that $v \in (c, c + 2t)$, and that $t > 0$. What price does the monopolist charge? (Hint: The monopolist does *not* sell to all consumers, since $v < c + 2t$).
7. Suppose that two firms lie on opposite ends of the line segment, that $v > c + 3t$, and that $t/2 > 0$. What prices do these two firms charge in Nash equilibrium? (Hint: The duopolists sell to all consumers, since $v > c + 3t$.)
8. Suppose that two firms lie on opposite ends of the line segment, that $v > c$, and that $t = 0$, so that the firm with the lowest price captures the market, with the market being split evenly when both firms charge the same price. Under what conditions is monopoly pricing supported as an equilibrium if the stage game is infinitely repeated?

IV. Answer questions 9 and 10 below.

9. Both (i.) define a private-ownership economy and (ii.) identify the conditions for an allocation to constitute a Walrasian equilibrium in a private-ownership economy.
10. Specify the conditions that must be satisfied for each of the following to hold and briefly discuss how restrictive (or realistic) those conditions are.
 - i. There exists at least one Walrasian equilibrium.
 - ii. The Walrasian equilibrium is unique.