

Math for Economists

Economics 4150 Spring 2023

ANDREW POSTLEWAITE
515 PCPSE, apostlew@upenn.edu
Office Hours: to be announced
Teaching Assistant:
@sas.upenn.edu
Office Hours: to be announced

Prerequisites (strictly enforced): The prerequisites are Math 1400 (formerly 104) and Math 1410 (formerly 114 and 115) (college calculus II – multivariate), and Econ 2100 and Econ 2200 (intermediate micro and macro; formerly Econ 101 and 102) Some knowledge of elementary probability theory, as is taught in Econ 2300 (formerly Econ 103), will be helpful.

Topics. We study the following mathematical ideas, primarily regarding optimization, and their uses in economics.

1. Review of differentiability. First-order conditions for optimality.
2. Consumer problem. First-order Lagrangian conditions.
3. Shadow prices. Comparative statics. Implicit function theorem.
4. Value functions. Total differentiation. Envelope theorems.
5. Convexity and concavity.
6. Separating hyperplanes. Second welfare theorem.
7. Second-order conditions for optimality.
8. Choice under uncertainty. Expected utility, risk aversion.
9. Introduction to dynamic programming.

The class will meet Tuesdays and Thursdays from 1:45 to 3:15 in ????. Course material will be posted on the course website. The course will be evaluated on the basis of five problem sets (10%) and two or three midterms; there will be no final exam. The midterms are not cumulative. The exams are in class and are closed book. The exams will be based on the material covered in lecture. The homework assignments can be discussed but should be written and submitted individually online. No make ups for midterms. If you have an officially valid excuse and cannot take a midterm, the remainder of the grades will be given a proportionally higher weight.

Students are encouraged to read the departmental policies, in particular, the policy on excused absences and make-up exams.

Texts. The following books should be available at Penn Bookstore.

- Dixit, Avinash K., *Optimization in Economic Theory*, Oxford, 1990 (2nd ed).
- Simon, Carl P. and Lawrence Blume, *Mathematics for Economists*, Norton, 1994.

The lectures will be more advanced than D and less advanced than SB. If you contemplate going to graduate school in economics or some related field, you should buy and master SB. Some homework problems will be taken from both books.

Due dates for problem sets will be announced at least one week before they are due.