Mathematics for Economists

Economics 205, Fall 2007

General Information

Instructor: Joel Sobel
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Office Hours: After class
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Homepage (with link to handouts for course):
http://www.econ.ucsd.edu/%7Ejsobel/205f07/205f07home.htm
Teaching Assistant: Philip Neary

Organization

The class meets from 8:00 to 10:00 every weekday from Wednesday, August 29 through Monday, September 24, with the following exceptions: There is no class on September 3, 7, 17, and 19. On August 29, the class will meet from 8:40 to 10:40. I will also use time between 10:00 and 11:00 if necessary for quizzes or to stay on schedule.

In addition, the classroom will be available from 1:00-4:00 for study sessions on all days except August 29, September 17, September 19, and September 21. On some days, the TA or I will supervise a problem session. On other days, students can use the room to work together on class material.

Description

This course is a rapid overview of topics in calculus, advanced calculus, optimization, and linear algebra that are relevant to economic theory. I hope that it provides the necessary mathematical background to begin the core graduate sequence. The course covers a large amount of material at a relatively high level of rigor.

If you have mastered the material in standard upper-division analysis and linear algebra classes, then this class should contain little that is new. If it has been a long time since you have used calculus, then the course will be difficult. If you have never used calculus, then the course may be impossible.

To avoid misunderstandings, let me emphasize that the class is not simply a review of lower-division calculus. Nor does it cover all (or even most) of the mathematics used in the core classes.

Requirements

The main evaluation will be a three hour, closed book, closed notes examination currently scheduled for Tuesday, September 25 from 8:00 to 11:00. If you take the course for credit, your grade will be the maximum of your grade on the final examination, and a weighted average of your final exam grade (75%), and your performance on quizzes. If you do not take the class for credit, then you must still pass the final examination in order to enroll in Economics 200A.

Problems are a necessary part of learning the material. I will make available relevant problems from a basic calculus book by Apostal, Chiang's book on mathematics for economists, and an vector calculus book by Marsden, Tromba, and Weinstein. These problems mostly cover elementary material. You may want to concentrate on these problems if you are having difficulty with the course material. Relevant problems are also available in the texts. There will be a list of problems posted on the web page. I will suggest problems from texts in most class periods. You should attempt to do them throughout the course.

Texts and Course Material

(SB) C. Simon and L. Blume, Mathematics for Economists

(N) W. Novshek, Mathematics for Economists

(D) A. Dixit, Optimization in Economic Theory, 2nd edition

(MA) K. G. Binmore, Mathematical Analysis

(C) K. G. Binmore, Calculus

(CH) A. Chiang, Fundamental Methods of Mathematical Economics

(SB) should be available in the University Bookstore. I have copies of all books (and others). In addition to these books, Philip Neary has organized Joel Watson's notes from the 2005 version of this class. I will make an effort to update and augment these notes throughout the class. The notes will be posted on my web page.

There are many books that cover the basic material of this course. Feel free to use another book as a primary reference. (If you are not sure whether another book is adequate, then check with me.)

If you are searching for a text, here are my views. (SB) is officially the text for the course. It has the following strengths: it contains many economic examples; it covers the topics that I intend to cover; it covers other material that you should know; it has many problems and solutions. On the other hand, it is poorly organized and its level of treatment is uneven. My lectures will be quite different from the text material. (N) is concise, covers most of the topics, and has many problems and solutions. Its coverage of one-variable calculus is brief and its approach to optimization is mechanical. (D) is a nice introduction to optimization from the perspective of economics. (MA) is a concise introduction to "advanced" one-variable calculus. It presents definitions and theorems with care and provides an introduction to proofs. It is slightly more advanced than the course will be. It may be a good place to look if the material in the first week seems to easy. (C) is more basic than (MA). It has reasonable coverage of most of the topics of multi-variable calculus. (CH) is a standard reference for courses in mathematics for economists, but I find it too mechanical. It may be a good place to look if the lectures seem difficult. Dixit contains material relevant to the optimization topics.

Paternalism: You cannot learn mathematics by reading a book. It is better to work problems. It is better still to pose problems yourself and try to solve them.

Topical Outline and References

The table on the next page lists the topics that I hope to cover. (I rarely reach differential equations and integration.) It relates the topics to pages in five of the texts mentioned above. The number of pages devoted to each topic varies drastically from text to text. The quality and the level of treatment vary as well.

Topic	Ch	MA	C	N	SB
Basic Concepts	132-44	1-48;65-84		1-2; 36-42	3-9; 847-57
Continuity	145-49	85-91		2-3; 42-44	10-21
Differentiability	128-32;149-74	92-100		3-5	22-34;39-42;70-4
Mean Value Theorems	254-62	101-8		5-6	822-32
Extrema, Concavity					43-6; 51-69
One-variable wrap up		138-43			75-103
Vectors	54-87		1-32		199-204;209-30
Eigenvalues					188-94; 579-84;601-7;609-15
Quadratic Forms					375-86;398-404;620-32
Vector Calculus	169-78		39-59	56-70	273-95;301-5;313-28
Multi-variable MVT			101-29	70-73	328-32;832-6
Implicit Functions	184-86;204-27		161-211	133-46	334-64
Unconstrained Optimization	231-54; 307-68		149-54	6-7; 73-77	375-86;396-410
Equality Constraints	369-432		85-95	77-103	411-23;478-80
Inequality Constraints	688-755		131-35	111-127	424-78;480-2
Integration	435-57		226-46	9-19	887-92
Differential Equations	470-96		313-32	20	633-665