



**MATHEMATICS FOR ECONOMISTS
ECON 72500**

Instructor: Professor Lilia Maliar
The Graduate Center, CUNY and Baruch College

1. Contact information

The Graduate Center, CUNY
Office: 5313.01 (the Graduate Center)
Phone: 212 817 8267
Email: lmaliar@gc.cuny.edu
<https://lmaliar.ws.gc.cuny.edu/>
Office hours: By appointment.

2. Course description, goals and topics

This is an introductory course in mathematics for economists. The goal is to familiarize the students with a set of fundamental mathematical tools that are frequently used in economics. The emphasis will be on application, while attention will be given to the underlying theoretical assumptions. As a main reference, I will use the books of Chiang and Wainwright (2005) and Casella and Berger (2002), as well as my lecture notes and slides.

We will cover the following topics (tentative):

1. Introduction. Mathematical economics.
2. Numbers. Sets. Relations and functions.
3. Matrix algebra.
4. Sequences and limits. Some topology concepts. Continuity. Fixed points.
5. Differentiation and its use in comparative statics.
6. Total differential, total derivative and the implicit function theorem.
7. Optimization with one variable and Taylor expansion.
8. Exponents and logs.
9. Optimization with more than one choice variable.
10. Optimization under equality constraints.
11. Optimization with inequality constraints.
12. Integration.
13. Differential equations. Optimal control (if time allows).
14. Probability: Basics of probability theory, Transformations and expectations, Common families of distributions.
15. Statistics: Point estimation and hypothesis testing.

3. Texts

Main:

- CHIANG and WAINWRIGHT, (2005). *Fundamental Methods of Mathematical Economics*, McGraw Hill.
- CASELLA, G. and R. BERGER, (2002). *Statistical inference*, Duxbury, Thomson Learning.

Additional:

- SIMON, C. and BLUME, L. (1994), *Mathematics for Economists*, Norton.
- SYDSAETER, K. and HAMMOND, P.J. (1995), *Mathematics for Economic Analysis*, Prentice Hall, New Jersey.
- SYDSAETER, K., HAMMOND, P.J., SEIERSTAD, A. and STROM, A. (2006), *Further Mathematics for Economic Analysis*, Pearson Education.
- TAKAYAMA, A. (1995), *Analytical Methods in Economics*, Harvester Wheatsheaf.

4. Logistic details

The course is composed of lectures and recitations. Recitations are taught by the teaching assistants. The every-day schedule is as follows:

- Lectures: Monday, 10:00am-1:00 pm, and Friday, 10:00 am-1:00 pm.
- Recitations (review of the key concepts and problem solving):
Economics: Tuesday, 2:00 pm-4:00 pm; Business: TBA

5. Homework

Three problem sets will be assigned. Not all material will be reflected in homework; you are encouraged to practice questions from the textbooks of Chiang and Wainwright (2005) and Casella and Berger (2002). Homework must be submitted individually. You are encouraged to work hard on homework: some questions on the exam will strongly resemble homework questions.

6. Teaching assistants

Economics: Christopher Naubert, cnaubert@gradcenter.cuny.edu

Business: Muhammed Yonac, Muhammed.Yonac@baruch.cuny.edu

Office hours: TBA

7. Evaluation

Your final grade will reflect your homework assignments (30%) and the final exam (70%). The final exam will include problems similar to those included in the problem sets, as well as brief questions about the theoretical issues discussed in lectures and recitations; the material considered in lab sessions is not included. The final exam will take place two weeks after the end of the course.

8. Schedule for lectures (tentative)

- Lecture 1 (3 hours). Monday, August 28. Introduction. Numbers. Sets. Relations and functions. Matrix algebra. Chiang and Wainwright (2005), Ch. 2, 4, 5.
- Lecture 2 (3 hours). Friday, August 31. Differentiation and its use in comparative statics. Total differential, total derivative and the implicit function theorem. Chiang and Wainwright (2005), Ch. 7, 8.

- Lecture 3 (3 hours). Monday, September 4. Optimization with one variable and Taylor expansion. Exponents and logs. Chiang and Wainwright (2005), Ch. 9, 10.
- Lecture 4 (3 hours). Friday, September 7. Optimization with more than one choice variable. Chiang and Wainwright (2005), Ch. 11.
- Lecture 5 (3 hours). Monday, September 11. Optimization under equality constraints. Chiang and Wainwright (2005), Ch. 12.
- Lecture 6 (3 hours). Friday, September 14. Optimization with inequality constraints. Chiang and Wainwright (2005), Ch. 13.
- Lecture 7 (3 hours). Monday, September 18. Integration. First-order differential equations. Chiang and Wainwright (2005), Ch. 14, 15.
- Lecture 8 (3 hours). Friday, September 21. Probability: Basics of probability theory, Transformations and expectations, Common families of distributions. Casella and Berger (2002), Ch. 1-2.
- Lecture 9 (3 hours). Monday, September 25. Common families of distributions. Casella and Berger (2002), Ch. 3.
- Lecture 10 (3 hours). Friday, September 28. Statistics: Point estimation and Hypothesis testing. Casella and Berger (2002), Ch. 7, 8.