ECON 508 (Summer 2007)
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Classroom: Lopata Hall 103 (till Aug 17th) & Eliot 216 (thereafter)

Syllabus

1 Overview

ECON 508 is a review course of basic mathematics and optimization techniques. The goal of this mini course is to provide you with a survival tool-kit for your graduate work (especially for the first year of course work). Depending on your background, you may find yourself comfortable with most or all of the material covered here. Nonetheless, I encourage you to put serious effort in ECON 508 not only because your grade on the test will be incorporated into your final grade in ECON 511 but also because you will come to appreciate what's been covered in ECON 508 pretty soon. Deeper and more rigorous math (analysis and some topology) will be taught in ECON 511.

2 Requirements

Class meets every weekday for two hours (9:00am to 11:00am) starting from August 1st for 14 days.

There will be a closed-book test on August 24th (Friday). As mentioned, your final grade on the test will be incorporated into your final grade in ECON 511.

There will be some homework problems given everyday. I will collect them at least once a week. Please come to talk to me if you have problems with the homework. As usually the case in graduate school, you are *encouraged* to work together. But you should try to solve the problems yourself first and you are expected to *write up the answers by yourself.*

3 Outline

We will cover

(1) univariate calculus (very brief)

Sequences of real numbers,limits of functions,continuity, differentiation in $\mathbb{R}$ and optimization.

(2) linear algebra

Linear spaces, convex sets, Euclidean spaces, linear transformation, matrices and the quadratic forms.

(3) multivariate calculus

Sequences in $\mathbb{R}^n$,open and closed sets in $\mathbb{R}^n$,functions from $\mathbb{R}^n$ to $\mathbb{R}^m$,continuity, differentiation, directional derivatives & the gradient vector and higher order derivatives & Taylor's Theorem.

(4) concavity

(5) optimization

Existence of solutions, optimization with a convex constraint set, optimization with equality constraints and optimization with inequality constraints.

The goal is to build a solid foundation in better understanding and tackling of optimization problems. To that end, the first four topics will be given enough treatment but the last topic is what I hope we could spend more time on.

4 Texts

To get a good sense of what math tools will be useful for the first year core sequence, refer to the concise and comprehensive math appendix of Mas-Colell, Whiston, and Green (1995).

There will be no required textbook for our mini course. A good reference book would be Simon and Blume (1994). Although I do not like the book that much I may still pick some problems from it.

A more advanced reference book for our course would be Angel de la Fuente (2000).

Other recommended textbooks include Chiang and Wainwright (2005) and Sundaram (1996).

The new edition of the classic book by Chiang, Chiang and Wainwright (2005), is recommended. Depending on your taste and your math background, you may find it very helpful. The previous edition of the book actually got me started. Chiang's books are usually reader-friendly since he takes great pains to motivate the readers and to explain things. On the downside, you may find the book wordy sometimes and the depth not enough. Notice the above comments are based on the previous edition of the book.

Sundaram (1996) gives an advanced treatment of optimization theory. You may find this book helpful.

References

[1] CHIANG, A. C., AND K. WAINWRIGHT (2005): *Fundamental Methods of Mathematical Economics (4th ed.)*. McGraw-Hill, New York, NY.

[2] DE LA FUENTE, A. (2000): *Mathematical Methods and Models for Economists*. Cambridge University Press, New York, NY.

[3] MAS-COLELL, A., M. WHISTON, AND J. GREEN (1995): *Microeconomic Theory*. Oxford University Press, New York, NY.

[4] SIMON, C. P., AND L. BLUME (1994): *Mathematics for Economists*. W. W. Norton, New York, NY.

[5] SUNDARAM, R. K. (1996): *A First Course in Optimization Theory*. Cambridge University Press, New York, NY.