

ECON 890: Quantitative Techniques II

Fall 2016

CREW

Peter Norman
normanp@email.unc.edu
Office 300C Gardner
Office Hours: 2:00-3:00 Tuesday and Thursday.

Adam Haas
adamhaas@live.unc.edu
Office hours to be announced.

WHEN AND WHERE

We meet 12:30PM-1:45PM at Graham Memorial Hall 35.
Review session time and place to be announced.

WHY

This course serves two distinct purposes. The most obvious is that while a Ph.D. economist need not be a mathematician, there are certain areas in mathematics that are crucial for the understanding of some important results and methods used in economics. For example, in macroeconomics it is important to have a good understanding of dynamic programming, which in turn requires some functional analysis, in microeconomic theory, duality and separation results are often useful, and in virtually any branch of economics it is crucial to have an understanding of optimization theory that goes beyond a cookbook treatment. In addition to this, the course will hopefully teach you to develop your ability to use logical arguments.

TEXT

There is no official textbook, but the following texts are strongly recommended:

1. A. N. Kolmogorov, and S. V. Fomin, *Introductory Real Analysis*, Dover Publications, New York, 1975
2. W Rudin, *Principles of Mathematical Analysis*, Walter Rudin, 1976.
3. N Stokey, and R Lucas, *Recursive Methods in Economic Dynamics*, Stokey, Harvard University Press, 1989.

Other texts that are recommended (but are at a somewhat more advanced level) are:

1. A. N. Kolmogorov, and S. V. Fomin, *Elements of the Theory of Functions and Functional Analysis*, Dover Publications, New York, 1999

2. H. L. Royden, *Real Analysis*, 3d Edition, Prentice Hall, Englewood Cliffs, 1988.
3. W. A. Sutherland, *Introduction to Metric and Topological Spaces*, Oxford University Press, Oxford, 1975.

EXAMS AND PROBLEMS

There will be a midterm and a final exam:

Midterm: Tuesday October 18 (in class)

Final: Tuesday December 6 (in class).

There will also be problem sets assigned on a regular basis.

OUTLINE

The main focus of the course will be some topics in real analysis that are used frequently in economics. A sketch is as follows:

1. SET THEORY AND FUNCTIONS

1. Operations on sets
2. Functions and mappings
3. Finite and infinite sets
4. Countability

2. METRIC SPACES

1. Definitions and Examples
2. Open and Closed Sets
3. Convergence and Limits
4. Complete Metric Spaces
5. Contraction Mappings

3. TOPOLOGICAL SPACES

1. Definitions and Examples
2. Compactness
3. Bolzano-Weierstrass theorem
4. Theorem of the Maximum

4. MORE ON FIXED POINT THEOREMS

1. Brouwer

2. Kakutani
3. Supermodularity

5. LINEAR SPACES AND SOME LINEAR ALGEBRA

1. Definitions and Examples
2. Convex sets and functions
3. Separation Theorems
4. Farkas lemma and duality in linear programming