Mathematics for Social Science III

1st Session 2016

I Course Objectives

A course of this nature aims to give the beginning graduate student the tools necessary to read papers which detail social science theories in mathematical form. The only way to build an intuition for mathematics is to solve many problems and the only way to build an intuition for social science theory is to read many papers with a pencil or pen in hand. Hopefully, you have already set aside time for a program in reading the content in your field and discussing its deeper implications. This is best done with a small group of students and possibly professors who decide to concentrate on a particular paper and discuss it. To get you started with the mathematical problem solving we will solve many problems in class. Different branches of mathematics play a role in social science theory. That role is largely to transform ideas from a difficult form to a more manageable one. Advanced linear algebra serves to bring multidimensional concepts into a simpler algebraic form. Differential equation serves to bring systems into a form understood by the calculus or algebra student. Calculus serves to simplify dynamic content into a simpler algebraic form. Theory, experimentation, and statistics or econometrics are important parts of all branches of social science. Thus, mathematics can help to illuminate concepts and convert coffee table conversation to measurable data.

II Instructor: Don Eckford  Email: don.eckford@gmail.com

Office Hours: MWF Hour after class or by appointment just email in advance;
Office Helen Newberry Room TBA

III Class Organization, Time, and Location

MTWThF  _____________        Room ______________

IV Textbook(s) and other materials

**Recommended:** There is no one recommended text. But many text cover some of the material in this course. The course is basically a grab bag of the mathematical ideas you will expected to “know” in other ICPSR courses. Many courses will build up the statistical ideas but assume the student knows the calculus, algebra, or the relevant math that is discussed. It would be good to have a calculus, a probability, or econometrics textbook nearby. **Online Sources:** There are many places online where you can see videos of individuals solving problems like we will do in class. Simply “google” the name of a concept to find an example. **Recommended:** MIT OCW; Coursera or Ed.X depending on the course and schedule.

**Some useful text.** Wooldridge, Introductory Econometrics, 3E, 2006, or beyond, Simon and Blume, Mathematics for Economists, 1994, Casella and Berger Statistical Inference, 1990, Elements of Dynamic Optimization, Chiang, Alpha C 1992, any college level Calculus Text, also Establish a Khan Academy account for Integral Calculus and Differential Calculus, you may add me as “Coach” if you like. I will send out an email about this the 1st week of class.
Grades:
Scale: ICPSR’s scale for A+, A, A-, B+, B, B-, etc. will be followed.

Schedule: First Session Math for Social Science 3

Week 1: Econometric Theory
Week 2: Probability Theory
Week 3: Sampling Theory/ Parameter Estimation and Inference
Week 4: Calculus, Linear Algebra and its applications

Topics from any particular week may. As this class is followed by a full calculus class in the 2nd Session the Calculus here just hits the essentials.

In order to learn anything well we must be able to pose and solve problems involving the concepts. This is different from learning a memorized framework to solve a particular problem. Both are useful in context but the former is an indication of deeper learning of a concept. Time will be spent in class organizing students into groups and working out posed problems from the above concepts. It is also recommended to read papers in your disciplined that you econometric, probability, sampling, calculus, or linear algebra theory to justify arguments. Learning how concepts are talked about