Mathematical Methods for Political Science

Department of Political Science
W4360, Fall 2012
MW, 8:40am – 9:55am
304 Hamilton Hall

Instructor: Nick Beauchamp
Email: nb2389@columbia.edu
Office: 712, International Affairs Building
Office Hours: MW, 10am-11am, and by appt.

TA: Andy Guess
Email: amg2232@columbia.edu
Office Hours and Discussion Section: TBA

This course introduces students to the basic mathematical concepts and tools frequently used in political science. The course, or knowledge of its contents, is a prerequisite for the advanced statistics (POLS 4912) and formal modeling courses (POLS 4210). Students are assumed to remember basic high school algebra, but will be given assistance to get up to speed if necessary. No prior knowledge of calculus or linear algebra is necessary.

Texts

1. Carl P. Simon and Lawrence Blume, *Mathematics for Economists*.
2. Daniel J. Velleman, *How to Prove It: A Structured Approach*.

Both books are available at *Book Culture*.

Requirements

1. Homework assignments and participation (40%). Please attempt to do assignments on your own, and only consult your peers if you are definitively stuck. Solutions must be written individually in all cases.
2. Exams: There will be a midterm (30%) and a final exam (30%).

Course Outline

The course will cover the topics presented below. The exact dates for each topic will depend on our progress.

Before Midterm

1. **Foundations of mathematics**. This module will cover standard mathematical notation; methods of proof; set theory; open and closed sets; ordered pairs.

2. **Linear Algebra**. Matrices; matrix operations; vectors; inverses of matrices; solutions to systems of linear equations.

After Midterm

1. **Differential Calculus**. Sequences and limits; continuity; differentiability; derivatives; functions and correspondences.

2. **Integration**. Concept of integral; common integrals; integration by parts.

3. **Optimization**. First and second order conditions; Necessary and sufficient conditions for global maxima; constrained maximization, Kuhn-Tucker nonlinear programming.