Math Camp Summer 2017

Instructors:	Amanda Kennard and Korhan Koçak
Office:	Corwin 031 (Amanda) and Corwin 025 (Korhan)
Office Hours:	4:00pm – 6:00pm, or stop by anytime
Email:	`kennard@princeton.edu` `kkocak@princeton.edu`
Faculty advisers:	Kristopher Ramsay and Kosuke Imai

Course Description: The math camp reviews basic calculus and linear algebra, as well as introducing the fundamentals of real analysis necessary for graduate courses in formal and quantitative methods.

The goal of the camp is twofold. The first is to provide an opportunity to review the basic tools in calculus and linear algebra by solving a number of practice problems. To achieve this goal, the math camp is **NOT** designed to teach these materials to students for the first time. Rather, it will focus on applying basic calculus and linear algebra tools to solve mathematical problems.

The second goal is to facilitate a smooth transition to the mathematical foundation course (POL 502). For this goal, we will cover the basic concepts of real analysis. Specifically, the camp will ensure that students can use these basic concepts to prove mathematical propositions. POL 502 will built on the materials covered in this part of the camp.

Course Structure: The camp will take place from **August 28th to September 8th** except for Labor Day, September 4. The course will meet for 9 days with a morning session and an afternoon session each day. The morning session is from **10:00 am to 11:50 am**, and the afternoon session is from **1:30 pm to 3:20 pm**. There will be daily problem sets to be completed outside of class. The topics for each day's session can be found below.

Course Requirements: There will be daily problem sets and a take-home final exam on September 8th (due September 11th). Each problem set will be distributed at the end of each morning session, and will be due by **10 am** on the following day. The problem sets and the final exam will be graded and solution sets will be distributed. Students are allowed to work together on problems, but you will learn much better if you try them on your own first before consulting with others: solving problems on your own is the only way to learn mathematics! Please remember that you are required to write up your solutions individually.

Course Textbooks:

- Preview Materials

    - Gilbert Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press. Various useful materials available at `http://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010`

    - Adrian Banner, *The Calculus Lifesaver*, Princeton University Press. Videos of lectures are available at `http://press.princeton.edu/video/banner/`

- Sessions: We do not use any particular textbooks for the sessions. In addition to the two books above, you can refer to the following books.

    - Michael Spivak, *Calculus*, Publish or Perish, Inc.
    - David C. Lay, *Linear Algebra and Its Applications*, Addison-Wesley.
    - Carl P. Simon and Lawrence E. Blume, *Mathematics for Economists*, W. W. Norton & Company.
    - Michael Reed, *Fundamental Ideas of Analysis*, Wiley.
    - Serge Lang, *Undergraduate Analysis*, Springer.

Session Schedule

Day	AM/PM	Topics	Details
28-Aug	AM	Set Theory	The basics of Set Theory
28-Aug	PM	Proofs	Proof Techniques
29-Aug	AM	Real Analysis	The Real numbers
29-Aug	PM	Real Analysis	Metric Spaces
30-Aug	AM	Real Analysis	Sequences and Series
30-Aug	PM	Real Analysis	Convergence
31-Aug	AM	Calculus	Limits of functions
31-Aug	PM	Calculus	Continuity
1-Sep	AM	Calculus	Differentiation
1-Sep	PM	Calculus	Optimization
5-Sep	AM	Calculus	Integration
5-Sep	PM	Calculus	Taylor Expansions
6-Sep	AM	Linear Algebra	Vector Spaces
6-Sep	PM	Linear Algebra	Matrices
7-Sep	AM	Linear Algebra	Determinants and the Inverse
7-Sep	PM	Linear Algebra	Matrix Differentiation
8-Sep	AM	Review Session	Calculus & Linear Algebra
8-Sep	PM	Review Session	Real Analysis & General Questions
8-Sep	AM	Final Exam	(take-home)