Math Camp Summer 2015

Instructors:	Ted Enamorado and Saurabh Pant
Office:	Corwin 021 (Ted) and Corwin 026 (Saurabh)
Office Hours:	4:00pm – 6:00pm, or stop by anytime
Email:	`tede@princeton.edu` `pant@princeton.edu`
Faculty advisers:	Kristopher Ramsay and Kosuke Imai

Course Description: The math camp reviews basic calculus and linear algebra, as well as it introduces the fundamental ideas of real analysis necessary for graduate courses in formal and quantitative methods.[1]

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 (POL502). 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. POL502 will built on the materials covered in this part of the camp.

Course Structure: The camp will take place from **August 31st to September 14th**. The course will meet for 10 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 final exam on September 14th. 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 are available at `http://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010`

---

[1]The details of these courses are available at `http://www.princeton.edu/politics/about/file-repository/public/FQcourses-2014.pdf`

– 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*, Addsion-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
31-Aug	AM	Calculus	Limits of functions
31-Aug	PM	Calculus	Continuity
1-Sep	AM	Calculus	Differentiation
1-Sep	PM	Calculus	Optimization
2-Sep	AM	Calculus	Integration
2-Sep	PM	Calculus	Multivariate calculus
3-Sep	AM	Linear Algebra	Vector spaces
3-Sep	PM	Linear Algebra	Linear transformations
4-Sep	AM	Linear Algebra	Projection
4-Sep	PM	Linear Algebra	Determinants and inverse
8-Sep	AM	Linear Algebra	Eigenvalues and eigenvectors
8-Sep	PM	Axioms/Proofs	Operations and relations on $\mathbb{R}$
9-Sep	AM	Real Analysis	Sets and functions
9-Sep	PM	Real Analysis	Real numbers
10-Sep	AM	Real Analysis	Sequences and series
10-Sep	PM	Real Analysis	Convergence
11-Sep	AM	Review Session: Calculus & Linear Algebra	
11-Sep	PM	Review Session: Real Analysis & General Questions	
14-Sep	AM	Final Exam	