

Instructor: James Banovetz
Office: North Hall 3017
Contact: jbanovetz@umail.ucsb.edu
Office Hours: TBD
Classroom: TBD
Dates: August 28th - September 15th, M-F
Time: 10:00 AM - 11:30 AM and 1:00 PM - 2:30 PM
Websites: sites.google.com/site/jamesbanovetz/teaching

Course Description

Math Camp is designed to bridge materials and concepts you encountered during your undergraduate preparation and new technical skills that will be covered extensively in your first-year PhD sequences. The focus of the class is on mathematical concepts and tools useful in your first-year classes (and more generally during your career as an economist). Some topics may be familiar to many students and are presented as a refresher; others will be new material that will be useful moving forward.

The course assumes that you are familiar with multivariate calculus, basic linear algebra, and basic probability and statistics. Brief reviews of these subjects will be provided, but the topics presented will mainly be motivated by their usefulness within the economics profession (preference theory, optimization, econometrics, etc). The course will also cover topics from real analysis, set theory, optimization, mathematical statistics, and other relevant fields.

The course will be split by subjects:

- Class A (Mornings): Linear Algebra, Probability, and Statistics
- Class B (Afternoons): Logic, Calculus, and (Basic) Programming

Assignments and Workload

To (re)familiarize yourself with this material, exercises will be provided for the topics covered in class. These exercises are optional and it is not necessary to complete all problems. Pace yourself and understand what is helpful to you. You are encouraged to use answer guides (which are often available online) to check your work for problems drawn from textbooks. Answers will not always be provided for every exercise.

There is a reason to format the class in this manner: everything in the first year should be oriented towards passing the preliminary exams. To do this, you must learn how to become fluent in various concepts and balance your workload. You need to understand when you are comfortable with a particular concept, so that you can move on to other material (there is *always* something else to study).

Evaluation

There is no grade for this class. While Math Camp will not directly affect your grades or academic standing, the class is provided as a tool to you. It is up to you to make the most of the opportunity provided.

Source Materials (Tentative)

Course Materials (including lectures, notes, and problems) will largely be drawn from the following list. You are ***not required to purchase any of these materials!*** These are all useful textbooks to have on hand, however, and may be used in future classes.

- Casella, George, and Roger L. Berger. *Statistical Inference* (2nd edition). Thomson Learning, 2002.
(used in Econ 241A)
- Chiang, Alpha C., and Kevin Wainwright. *Fundamental Methods of Mathematical Economics* (4th edition). McGraw Hill, 2005.
- Jehle, Geoffrey A., and Philip J. Reny. *Advanced Microeconomic Theory*. Prentice Hall, 2011.
(used in Econ 210A)
- Lay, David C., Steven R. Lay, and Judi J. McDonald. *Linear Algebra and Its Applications* (5th edition). Pearson Education, 2015.
- Simon, Carl P., and Lawrence E. Blume. *Mathematics for Economists*. W.W. Norton & Company, 1994.

Other Useful Materials

These materials are recommended for those looking to review the basics of economics before the beginning of the year. These are not used for Math Camp, but are good resources generally. Older editions may be available at discounted prices.

- Hirshleifer, Jack, Amihai Glazer, and David Hirshleifer. *Price Theory and Applications: Decisions, Markets, and Information* (7th edition). Cambridge University Press, 2005.
(intermediate micro)
- McAfee, R. Preston, Tracy R. Lewis, and Donald J. Dale. *Introduction to Economic Analysis* (Version 2.1). Available at:
<http://www.muhlenberg.edu/media/contentassets/pdf/economicanalysis/IEA.pdf>
(principles of economics, free!)

Other Useful Materials (cont.)

- Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach* (5th Edition). Cengage Learning, 2013.
(*basic econometrics*)

Topic List and Schedule (Tentative)

	Class A	Class B
Week 1 (5 Classes)	<u>Linear Algebra I: Notation, Operations, Systems of Equations</u> <u>Linear Algebra II: Eigenvalues & Eigenvectors, Projections, Differentiation</u>	<u>Logic: Notation, Introduction to Writing Proofs, Truth Tables</u> <u>Set Theory: Notation, Operations, Functions & Correspondences</u> <u>L^AT_EX Basics: Basic Formatting, Mathematical Typesetting</u>
Week 2 (4 Classes: No class 9/4)	<u>Probability Theory I: Sets, Probability Functions, Combinatorics, Random Variables</u> <u>Probability Theory II: Distribution Functions, Moments, Transformations, Multivariate Distributions</u>	<u>Real Analysis: Continuity, Closure, Boundedness, Compactness, Convexity</u> <u>Convex Analysis: Convexity & Concavity, Quasiconvexity & Quasiconcavity</u> <u>Python Basics: Loops, “If” Statements, Basic Algorithms</u>
Week 3 (5 Classes)	<u>Statistics I: Estimation, Evaluating Estimators, Sufficiency, Completeness</u> <u>Statistics II: Hypothesis Testing, Convergence Concepts, Linear Models</u>	<u>Unconstrained Optimization: Maxima & Minima, Critical Points, Inflection Points</u> <u>Constrained Optimization: Equality & Inequality Constraints, Lagrangians, Kuhn-Tucker Theorem, Shadow Values</u> <u>MatLab Basics: OLS, Search Routines, Functionalizing Code</u>