

	Class A	Class B
<b>Instructor:</b>	Woongchan Jeon	Hakan Ozyilmaz
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<b>Office Hours:</b>	TBA	TBA
<b>Classroom:</b>	North Hall 2111	
<b>Dates:</b>	August 26 <sup>th</sup> - September 13 <sup>th</sup> , M - F	
<b>Time:</b>	10:00 AM - 11:30 AM	1:00 PM - 2:30 PM

## 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 Ph.D. sequences. The focus of the class is on mathematical concepts and tools useful in your classes (and more generally during your career as an economist). Most topics should be familiar to most 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, linear algebra, probability theory, and mathematical statistics. Brief reviews of these subjects will be provided, along with material from real analysis, set theory, optimization, and other relevant fields. When possible, topics will be motivated by their usefulness within the economics profession (e.g. as they relate to preference theory, econometrics, etc.).

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, six problem sets will be provided for the topics covered in class. On each problem set, there will be required problems that must be typed neatly in L<sup>A</sup>T<sub>E</sub>X and submitted. Additional problems will also be included for practice as needed.

You are heavily encouraged to work in small groups, both in Math Camp and in your first-year coursework. In addition, you may use answer guides (which are often available online or in textbooks) or stop by office hours, as answers to optional problems will not always be provided.

Note that everything in the first year should be oriented towards passing the preliminary exams. 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. Use it as the first step towards preparing for prelims.

## 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.
- Lay, David C., Steven R. Lay, and Judi J. McDonald. *Linear Algebra and Its Applications* (5th edition). Pearson Education, 2015.
- Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green. *Microeconomic Theory*. Oxford University Press, 1995.  
(used in Econ 210A)
- Simon, Carl P., and Lawrence Blume. *Mathematics for economists* (7th edition). New York: Norton, 1994.
- Smith, Douglas, Maurice Eggen, and Richard St. Andre. *A Transition to Advanced Mathematics* (7th edition). Cengage Learning, 2011.

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

## Topic List and Schedule (Tentative)

	Class A	Class B
<b>Week 1</b> (5 Classes)	<u>Linear Algebra I: Notation, Operations, Systems of Equations</u> <u>Linear Algebra II: Eigenvalues &amp; Eigenvectors, Projections, Differentiation</u>	<u>Logic: Notation, Introduction to Writing Proofs, Truth Tables</u> <u>Set Theory: Notation, Operations, Functions &amp; Correspondences</u> <u>L<sup>A</sup>T<sub>E</sub>X Basics: Basic Formatting, Mathematical Typesetting</u>
<b>Week 2</b> (4 Classes: No class 9/2)	<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 &amp; Concavity, Quasiconvexity &amp; Quasiconcavity</u> <u>Python Basics: Loops, “If” Statements, Basic Algorithms</u>
<b>Week 3</b> (5 Classes)	<u>Statistics I: Estimation, Evaluating Estimators</u> <u>Statistics II: Hypothesis Testing, Convergence Concepts, Linear Models</u>	<u>Unconstrained Optimization: Maxima &amp; Minima, Critical Points, Inflection Points</u> <u>Constrained Optimization: Equality &amp; Inequality Constraints, Lagrangians, Kuhn-Tucker Theorem, Shadow Values</u> <u>MatLab Basics: OLS, Search Routines, Functionalizing Code</u>