

GENERAL INFORMATION

Sequence	<i>Analysis</i>	<i>Linear Algebra, Statistics</i>
Instructor	Shu-Chen Tsao	Seonmin “Will” Heo
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Website	sites.google.com/view/shuchentsao	swheo.com
Office Hours	Wednesday 2:30 – 3:30 NH 3053	Monday 2:30 – 3:30 NH 3017
Classroom	North Hall 2111	
Dates	August 19 – September 6, M – F	
Time	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, tools, and skills 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 have some familiarity 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:

- Analysis Sequence: Logic, Proof Strategy, Real Analysis, and Optimization
- Linear Algebra and Statistics Sequence: Linear Algebra, Probability, and Statistics

We will also provide a brief introduction to \LaTeX and R; the former is one of the most popular document preparation software systems, and the latter is one of the most used statistical analysis software nowadays. We will have a couple of sections introducing the basics of programming in these languages.

ASSIGNMENTS AND WORKLOAD

To (re)familiarize yourself with this material, six problem sets will be provided for the topics covered in class. For each problem set, you will be assigned to a small group (2-3 people). Each group must work together to turn in one set of answers, typed neatly in \LaTeX and submitted by Tuesday the following week.

You are strongly encouraged to work in groups in your first-year coursework, either with your office mates or others that you work well with. Our hope is that by assigning you to groups during Math Camp, you can get to know one another and get comfortable working together.

Note that everything in the first year should be oriented towards passing the preliminary exams. 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). Prioritize understanding core concepts over turning in perfect problem sets.

TEXTBOOKS

Below are some textbooks that you may find helpful during Math Camp and beyond. **You are not required to purchase any materials for Math Camp.** You might find them useful to have on hand, however, and some will be used in future classes. (Many can be found for free online, as well as their answer keys.)

- Casella, George, and Roger L. Berger. *Statistical Inference* (2nd edition). Brooks/Cole, 2002.
- Chiang, Alpha C., and Kevin Wainwright. *Fundamental Methods of Mathematical Economics* (4th edition). McGraw Hill, 2005.
- Hansen, Bruce E. *Econometrics*. 2022.
- Mas-Colell, Andreu, Michael D. Whinston, and Jerry R. Green. *Microeconomic Theory*. Oxford University Press, 1995.
- 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* (8th edition). Cengage Learning, 2014.

OTHER RESOURCES

- Jonathan Levin notes “Useful Math for Economists” ([here](#), his other first quarter micro notes may be useful for 210A)
- Peter Troyan notes “Constrained Optimization” ([here](#))
- University of Arizona Math Camp Videos ([UAMathCamp on YouTube](#))

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 the preliminary exams.

TENTATIVE SCHEDULE

		Mon	Tue	Wed	Thu	Fri
Week 1	AM	(WH) Vectors and Matrices	(WH) Matrix Operations and Quadratic Forms	(WH) Eigenvalues and Eigenvectors	(WH) Vector Spaces and Norms	(WH and SCT) Topics on Proofs for Economics
	PM	(SCT) Sets and Logic	(SCT) Proof Strategies	(SCT) Functions	(SCT) Limits and Sequences	(WH and SCT) L ^A T _E X R Programming
Week 2	AM	(WH) Orthogonality, Projections, and OLS	(WH) Measure, Counting, Independence	(WH) Random Variables and Distribution Functions	(WH) Transformation and Moments	(WH) Multiple Random Variables, Random Sample, Statistics
	PM	(SCT) Continuity and Differentiation	(SCT) Topology on Metric Space	(SCT) Topology on Metric Space	(SCT) Multivariate Derivatives	(SCT) Integral Techniques
Week 3	AM	Labor Day No Class	(WH) Statistics and Estimation	(WH) Convergence and Hypothesis Testing	(WH) Methods in Applied Microeconometrics	(WH and SCT) Topics on Proofs for Economics
	PM		(SCT) Optimization	(SCT) Optimization	(SCT) Ordinary Differential Equation	(WH and SCT) R Programming Q&A

SCT: Shu-Chen Tsao

WH: Seonmin “Will” Heo