Econ 508A: Math Camp
Instructor: Xue Bai
Summer 2023
July 31 - August 18

Course Syllabus for Econ 508A

1   Basics

- Time: Mon-Fri, 10:30 am - 12:30 pm. There will be a short break each class.

- Location: Seigle Hall, Room 301.

- Instructor: Xue Bai. Feel free to call me Xue or Miss Bai.

- Email: xuebai@email.wustl.edu

- Office hours: email me for a Zoom appointment.

- Class notes: distributed on Canvas before each class. I may update some after class, so look out for Canvas notifications.

2   Course Description

Econ 508A is a 3-week course on essential mathematics (mostly optimization theory) for 1st year graduate students in Economics, Political Science and some of the Business disciplines. We will start from basic concepts in linear algebra, calculus, set theory, and then move on to optimization etc. For some of you these topics may seem easy, but this course should serve as a review and a warm up for those math-intensive first year PhD courses. At the end of this course, you should be comfortable with solving unconstrained and constrained optimization problems with multiple variables, and have a firm understanding of the Envelope Theorem.

3   Grading

This course does not offer a certificate. The course grade will not show up on your transcript. There will be small prizes for the top 5 students though!

- Attendance: 20%. Sign the attendance sheet before short break in each class.

- Assignments: 40%. Two weekly assignments (20% each) posted on Friday and due the next Monday 11:59pm on Canvas. Upload a pdf file only.

- Final Quiz: 40%. In class on Friday, August 18.

4 Topics

Topics may be slightly modified as we go

- Linear Algebra: matrix, system of equations

- Multivariate Calculus

- Real Analysis: sets, sequences, and limits

- (Quasi)Concavity and (Quasi)Convexity

- Unconstrained optimization

- Constrained optimization: Lagrangian, KKT

- Lagrange Multiplier

- Envelope Theorem

- Dynamic Programming (if time permits)

5 References

No textbook is required, the class notes should be self-contained. Feel free to look at lecture slides from previous years (https://sites.wustl.edu/econ508/past-class-information/) as we will be following that syllabus very closely. Below are some resources that I have relied on for the notes, or may be useful for you as a fresh graduate student:

- Professor John Nachbar has a set of carefully written, well organized class notes available on his website: https://sites.wustl.edu/nachbar/course-notes/math/

- Simon and Blume. *Mathematics for Economists*

- Mas-Colell, Whinston, and Green. *Microeconomic Theory*. This is the famous MWG micro textbook. You will learn a lot from the appendix.

- Sundaram. *A First Course in Optimization Theory*

- Stokey and Lucas. *Recursive Methods in Economic Dynamics*