

Math Camp 508 A

Instructor: Xiannong Zhang*

Summer 2021

Course Information

- Name: Math Camp 508A (Mathematics for economists)
- Time: Mon-Fri, 10:30 a.m. - 12:30 a.m CST
- Office hours: After class, or by appointment
- Contact: zhangxiannong712@gmail.com; zhangxiannong@wustl.edu
- Textbook: None
- Class notes: Distributed before each class.

Description

The goal of this course is two-fold (1) Get you warmed up for 1st year course work through studying the basic mathematical tools (2) Facilitate communication and team work.

To achieve the first goal, we will start from basic concepts in linear algebra, calculus, set theory, and move on to optimization. The first few lectures focus on introducing concepts, grasping intuitions, and discussing their applications in economics. The later half of the class focuses more on logic and proofs. For the second goal, team work is highly encouraged. You can form study groups containing up to 4 people and submit homework as a group.

The format of class is hybrid: The class will be taught in-person with online options. Check your Canvas for details. Your evaluation is independent of the form you take the class. We use class notes instead of slides in this course. Before each lecture, an incomplete class note will be uploaded and we will fill in the blanks together. There will be in-class exercises in each class.

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If you decide to take the course in-person, it is your responsibility to follow all the Wash U and Econ department COVID guidelines while on campus. If you decide to take the course online, try to take the class synchronously and complete all in-class exercises. If you have to take the class asynchronously, make good use of office hours and try to keep up with your classmates.

Reference

I found these resources useful when studying mathematics. None of these is required for this course. Consider this list as your resources and use it for the course and your future studies:

- Professor John Nachbar has a set of carefully written, well organized class notes available on his website <https://sites.wustl.edu/nachbar/>
- “Basic Mathematics for Economists” by Mike Rosser. A lot of details and good examples.
- “Microeconomic Theory” by Mas-Colell, Whinston, and Green. This is the famous MWG micro textbook. I have learned a lot from their appendices.
- “Microeconomic Foundations I: Choice and Competitive Markets” by David Kreps. Another good micro textbook.
- In recent years Stack Overflow taught me more than any one of these textbooks. Definitely search online when you have a more specific question.

Topic

Topics may be modified as we go

1. Linear Algebra: Matrix, linear systems
2. Calculus: functions, gradients, Jacobian, Hessian, Young’s Theorem.
3. Set theory: Sequence, open sets, closed sets, compact sets.
4. Concave functions: Definitions, properties, quasiconcave functions.
5. Unconstrained optimization: Monotone Convergence Theorem, Bolzano-Weierstrass Theorem, Weierstrass Theorem, Mean Value Theorem, Taylor expansion, necessary and sufficient condition for unconstrained optimization.
6. Constrained optimization: Implicit Function Theorem, Lagrangian, equality constraints, inequality constraints, meaning of multiplier, Envelope Theorem.

Evaluation

- Final quiz: 60%
- Assignments: 30%
- Attendance: 10%