

Math Camp

Summer 2022

University of International Business and Economics

Instructor: Guoxuan Ma

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Office: N/A

Class Meetings: 9:00am ~ 10:30am from Aug 16 to Aug 26 (except weekend)

Class room: Online

Office Hours: by appointment via email.

Course Introduction

The purpose of this course is to equip you all with basic mathematical tools you will need to tackle fundamental problems in micro, macro and econometrics. We will go through several economic examples along the way to familiarize ourselves with each concept. At the end of this course you should be comfortable with solving systems of equations, unconstrained and constrained optimization in multiple variables, the envelope theorem, necessary and sufficient conditions for optimization and the meaning of the Lagrange multiplier. There will be 7 lectures in total with the last day as the examination.

Books and references

There is no required textbook for the class. If you would like to support your learning with some textbooks, the following books cover some of the topics well:

- Sydsaeter, Knut, Peter Hammond, and Atle Seierstad. "Further mathematics for economic analysis." (2008). (FMEA)
- Rudin Walter. "Principles of Mathematical Analysis (International Series in Pure & Applied Mathematics)." (1976). (Rudin)
- Rakesh V. Vohra. "Advanced Mathematical Economics." (2005)
- Stokey, Nancy L., Robert E. Lucas Jr, and Edward C, Prescott. "Recursive Methods in Economic Dynamics." (1989). (SLP)

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- Mas-Collel, Whinston, and M. Green. "Microeconomic Theory." (1995). (MWG) (math appendix)

Course Outline & Topics

Topics with * might be skimmed or skipped. The topics may vary according to the lecture schedule.

1. Real Analysis (2 lectures)
 - Fundamentals: sets relations, functions
 - Metric spaces
 - Open sets and closed sets
 - Sequences and convergence
 - Continuous functions, Weierstrass theorem
2. Linear Algebra (1 lectures)
 - Matrices basic operation
 - Vector spaces
 - Linear dependence
 - Inner products, norms, and metrics
 - Systems of linear equations
 - Eigenvalues, eigenvectors, and diagonalization
3. Multivariate Calculus (1 lectures)
 - Derivatives
 - Taylor's formula and log-linearization
 - Implicit function and inverse function theorems
 - Integrals
 - Homogeneity and homotheticity
4. Convexity (1 lectures)
 - Convex sets
 - Separation hyperplane theorems
 - Convex and concave functions
 - Quasi-convex and quasi-concave functions
5. Static Optimization (2 lectures)
 - Optimization on an open set
 - Constrained optimization and Kuhn-Tucker theorem
 - Envelope theorem
 - *Dynamic programming (intro)

Grading

There will be 1 assignments over the first week and 1 final quiz at the end. Don't worry too much about the grading.

- Attendance: 20%
- Assignments: 30% (+15% option), released on Friday and submission on Monday
- Final Quiz: 50%

Statement of Academic Integrity

All students should act with personal integrity, respect other students' dignity, rights and property, and help maintain an environment in which all can succeed through their efforts.

Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University for possible further disciplinary sanction.