

Boston University, Department of Economics

Math Camp
Summer 2025

Instructor:	Luis Henrique R. Linhares	Class Dates:	Aug 18 – Aug 29 (M-F)*
Email:	lhrlinha@bu.edu	Class Hours:	9:00-11:00 & 12:00-2:00.
Location:	SSW 315	Office Hours:	By appointment

*There is no class on August 26th for orientation day.

COURSE DESCRIPTION

This course aims to introduce incoming PhD students to the mathematical knowledge required for their future classes and research. It introduces the topics of real analysis and some of the most commonly used mathematical tools in economics and econometrics.

Some students may have already seen some of these topics before, and in this case, this course should be seen more as a reinforcement, with a focus on the content that will be most necessary for the first years of the PhD. It is a good way to ease into classes and get to know your classmates in an environment with lower stakes and no exams.

COURSE OBJECTIVES

- To develop a formal and rigorous way to think about math.
- Practice constructing and understanding mathematical proofs.

COURSE REQUIREMENTS

There are no exams and no grades! I will give you problems during class and as homework, which you are encouraged to try (by yourself and in groups). This is the best way to prepare for the first year.

COURSE POLICIES

Emails: I aim to reply to emails as soon as possible, but please allow for a 24-hour wait on weekdays and 48 hours on weekends (consider how this affects your deadlines). Also, please include Math Camp in the subject line of all emails.

Attendance: Classes are in person, unless otherwise stated. Please, be on time.

References

There are no textbooks, as the lecture notes go over selected topics. However, if you are interested, you may use the following textbooks as complementary reference materials and to dive deeper into topics you like. There is no need to buy any of these books as they are available through the BU library. Most editions work for this course.

Mas-Colell, A., Whinston, M. D., & Green, J. R. (1995). *Microeconomic theory* (Vol. 1). New York: Oxford university press.

Rudin, W. (2021). Principles of mathematical analysis.

Greene, W. H. (2000). Econometric analysis 4th edition. *International edition, New Jersey: Prentice Hall*, 201-215.

Mas-Collel, Whinston & Green (MWG) can be used extensively in the first year of Microeconomics as supplemental material for classes. Its mathematical appendix summarizes most of the mathematical tools needed for graduate microeconomics. Rudin is a good book to improve your rigorous foundation in mathematical analysis, and Greene introduces many topics you will see in Statistics and Econometrics.

Course Outline

Real Analysis

- Logic, proof techniques
- Set theory
- Real numbers
- Sequences and convergence
- Euclidean Spaces
- Basic topology
- Compactness
- Functions (Continuous Functions, Homogeneous Functions, Concave/Convex Functions)

Introduction to Selected Topics

- Linear Algebra
- Probability theory
- Calculus
- Optimization