Math Camp

Brown University
Department of Economics

Summer 2021

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Office Hours: After class and by appointment

Times: 8/16, 8/17, 8/18, 8/19, 8/23, 8/24 from 9AM–12PM (10 min break)
Location: Robinson Hall Room 301

1 Course Description

Our goal is to make sure everyone is familiarized with the mathematical tools that are typically used in economic research. In particular, we focus on the tools that will help the students throughout the first year or their PhDs.

Keep in mind that this course should serve as a warm-up for the challenging first year that you'll have. We expect that, at the end of the Math Camp, the students are familiarized and comfortable with the theory presented, and are able to apply it throughout the first year.

Finally, many of the topics we will cover will be presented in a "Cookbook" way, perhaps without the details a rigorous and formal student ideally would want. A more rigorous presentation of the topics we will expose will come shortly (ECON 2010).

2 Recommended Reading

We do not follow a particular textbook in this course and hence you are not required to have any textbooks. In case you would like to read more about some topics, we suggest the following references: *Real Analysis with Economic Applications* by Efe Ok (henceforth Ok) and *Math for Economists* by Simon and Blume (henceforth SB). In past years these two books have been used in Econ 2010. Additional readings: *Principles of Mathematical Analysis* (aka baby Rudin) by Walter Rudin (henceforth, R) and *Microeconomic Theory* by Mas-Collel, Whinston and Green (henceforth MWG).

3 Homework Assignments

Every two lectures, I will send you a set of exercises that cover the topics we covered in the day. The assignments will not be collected (but feel free to ask me for feedback). The problem sets will consist of basic (and not-so-basic) questions regarding every topic we see. Their goal is to ensure you are aware of (and hopefully comfortable with) the math level that will be required throughout your first year, and to push you towards working together for the first time.

4 Accommodations for Students with Disabilities

Brown University is committed to full inclusion of all students. Any student with a documented disability is welcome to contact me as early in the summer as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Student and Employee Accessibility Services by calling 401-863-9588.

5 Tentative Schedule

Lecture		Topic	References
8/16 (Mon)	1st half	Introduction, Mathematical Proofs	Lecture Notes
	2nd half	Intro to Topology, Limits	Ok A.1–A.3, B.1, C.1
8/17 (Tue)	1st half	Sequences	Ok A.1–A.3, C.1, C.5
	2nd half	Continuity	Ok D.1, D.3
8/18 (Wed)	1st half	Correspondences	Ok E.1–E.3, MWG M.H
	2nd half	Compactness and Extreme Value Theorem	Ok C.3–C.4, MWG M.I
8/19 (Thu)	1st half	Differentiation and Implicit Function Theorem	Ok K.1–K.2, MWG M.E
	2nd half	Unconstrained Optimization	SB 17, MWG M.D, M.J
8/23 (Mon)	1st half	Constrained Optimization	SB 18, MWG M.K
	2nd half	Integration	Ok A.4
8/24 (Tue)	1st half	Linear Algebra	SB 10–11
	2nd half	Intro to ODE	SB 24–25