Location and Office Hours

We will meet in room 315 in Baxter Hall during weekdays, September 7th-24th, from 10am to noon. I’ll stay around after class if you want to discuss anything.

My office number is 136, phone extension x8772. If you have any questions, stop by. I might ask you to come back another time, but I will do my best to provide assistance. My email is gpf@hss.caltech.edu.

Objectives

The objective of the course is to present to you some mathematical tools and results that will be used throughout the first year. We will emphasize the intuition behind the results, and how to write good proofs. The material we will cover consists of those parts of real analysis, optimization and linear algebra that are most useful for microeconomic theory and econometrics. Unfortunately, we will not have much time to study probability.

There will be daily problem sets, and these are the heart of the course. In order to learn the material, you should do as many problems as you can. Contact me if you are having difficulty with a problem. Please, put some effort in writing well. Keep in mind you will be required to write many proofs in your first year, so if you have no experience with that, you should start practicing as early as possible.

I did not program anything for the last three days of the course in case we cannot cover one lecture per day. If we do cover one lecture per day, we will spend those last three days solving problems and I will try to answer any questions you might have about the material.

References

Here is a list of some books at the level of the course. The book that best approximates the content we will cover is de la Fuente’s book. Kim Border has notes on his website about almost all the topics we will cover.


• Robert B. Ash, *Real Variables with Basic Metric Space Topology*, (Dover, 2009).

Let me know if you are interested in other topics, more advanced references, etc.

Daily Plan

Week 1

Lecture 1: Sets, Numbers, and Relations
Lecture 2: Topology of $\mathbb{R}^n$
Lecture 3: Linearity and Convexity
Lecture 4: Separation and Tangency (Separating Hyperplanes and Derivatives)

Week 2

Lecture 5: Unconstrained Optimization
Lecture 6: Projections
Lecture 7: Least-Squares
Lecture 8: Optimization with Equality Constraints
Lecture 9: Optimization with Inequality Constraints

Week 3

Lecture 10: Probability
Lecture 11: Systems of Equations (Fixed Points and Implicit/Inverse Function Theorem)
Lecture 12: Undetermined
Lecture 13: Undetermined
Lecture 14: Undetermined