Proof-Based Math Readings Session: Optimization

2025 Spring

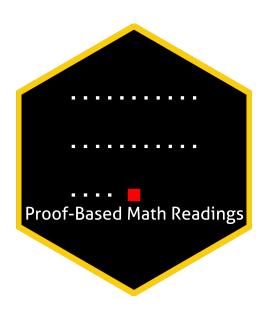
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Table of contents

0	Motivation
1	Prerequisites
2	Format
3	Resources 3.1 Main Book and Main Book's Playlist 3.2 Supplementary 3.2.1 Proof 3.2.2 Real Analysis 3.2.3 Optimization
4	Reading Schedule



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0 Motivation

- Proof-Based Math Readings is a free and independent online reading group where we study mathematics required in economics master's/PhD programs using an intuitive approach.
- This session of the reading group is on *Optimization*.

1 Prerequisites

- CGPA: 3.00/4.00.
- Proof resources below are the prerequisites for this session.
- Please use the **O** Application Form to join our reading group.
- Applicants are informed about their application results within a week via email.

2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at Proof-Based Math Readings [Discord].
- We do not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters from the book.

3 Resources

3.1 Main Book and Main Book's Playlist

A First Course in Optimization Theory (1996) by Rangarajan K. Sundaram is our main book because it is well-written and well-structured.

- 🛢 A First Course in Optimization Theory Rangarajan K. Sundaram (1996)
- 🗏 A First Course in Optimization Theory Rangarajan K. Sundaram (1996, Solutions by Frederick Robinson)
- 🗏 A First Course in Optimization Theory Rangarajan K. Sundaram (1996, Solutions by Paolo Pin)

3.2 Supplementary

3.2.1 **Proof**

- Book of Proof Richard Hammack (3.3 Edition, 2022)
- Book of Proof Richard Hammack (3.3 Edition, 2022, Playlist by Jeremy Teitelbaum)
- Book of Proof Richard Hammack (3.3 Edition, 2022, Playlist by Michael Penn)

3.2.2 Real Analysis

- Basic Analysis I: Introduction to Real Analysis Jiri Lebl (Version 6.0, 2023)
- Basic Analysis I: Introduction to Real Analysis Jiri Lebl (Version 6.0, 2023, Playlist by Casey Rodriguez)
- Introduction To Metric Spaces Paige Bright (2023)

3.2.3 Optimization

- Foundations for Optimization Mark Walker (2020)
- Optimization Mark Walker (2020)

4 Reading Schedule

AFCOT is the abbreviation of A First Course in Optimization Theory - Rangarajan K. Sundaram (1996).

Appendix A: Set Theory and Logic: An Introduction

Appendix B: The Real Line

Appendix C: Structures on Vector Spaces Chapter 1: Mathematical Preliminaries

Chapter 2: Optimization in \mathbb{R}^n

Chapter 3: Existence of Solutions: The Weierstrass Theorem

Chapter 4: Unconstrained Optima

■ AFCOT Week 07-08-09 **=**

Chapter 5: Equality Constraints and the Theorem of Lagrange

Chapter 6: Inequality Constraints and the Theorem of Kuhn and Tucker

Chapter 7: Convex Structures in Optimization Theory

Chapter 8: Quasi-Convexity and Optimization