

Proof-Based Math Readings

Session: Optimization

2025 Spring

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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 [🔗 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).

 AFCOT	Week 01-02 
Appendix A: Set Theory and Logic: An Introduction Appendix B: The Real Line Appendix C: Structures on Vector Spaces Chapter 1: Mathematical Preliminaries	
 AFCOT	Week 03-04 
Chapter 2: Optimization in \mathbb{R}^n	
 AFCOT	Week 05-06 
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	
 AFCOT	Week 10-11-12 
Chapter 7: Convex Structures in Optimization Theory Chapter 8: Quasi-Convexity and Optimization	