

Proof-Based Math Readings

Session: Optimization*

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Table of contents

0	Motivation	2
1	Prerequisites	2
2	Format	2
3	Resources	2
3.1	Main Book and Main Book's Playlist	2
3.2	Supplementary	2
3.2.1	Optimization	2
3.2.2	Proof Techniques	2
3.2.3	Real Analysis	2
4	Reading Schedule	3
5	Further Readings (Optional)	3



0 Motivation

- *Proof-Based Math Readings* is a free, independent online reading group where we study the mathematics required for economics master's and PhD programs through an intuitive approach. Active since May 2023.
- This session of the reading group is on *Optimization*.

1 Prerequisites

- Proof Techniques resources below.
- Please use the  **Application Form** to join our reading group; you will receive a response within a week.




2 Format

- This session takes 12 weeks. We do not have face-to-face/online meetings due to the size of the group.
- Members read the main book and discuss the topics/exercises in the Proof-Based Math Readings Discord .

3 Resources

3.1 Main Book and Main Book's Playlist

A First Course in Optimization Theory - Rangarajan K. Sundaram (1996) 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 Optimization

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

3.2.2 Proof Techniques











-  Book of Proof - Richard Hammack (3.4 Edition, 2025)
-  Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Jeremy Teitelbaum)
-  Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Michael Penn)

3.2.3 Real Analysis



-  Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.1, 2024)
-  Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.1, 2024, Playlist by Casey Rodriguez)
-  Introduction To Metric Spaces - Paige Bright (2023)

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	

5 Further Readings (Optional)

 Optimization by Vector Space Methods - David G. Luenberger (1997)
 Optimization by Vector Space Methods - David G. Luenberger (1997, Playlist by Peter Galbacs)