

Proof-Based Math Readings

Session: Optimization*

Zeki Akyol

Department of Economics

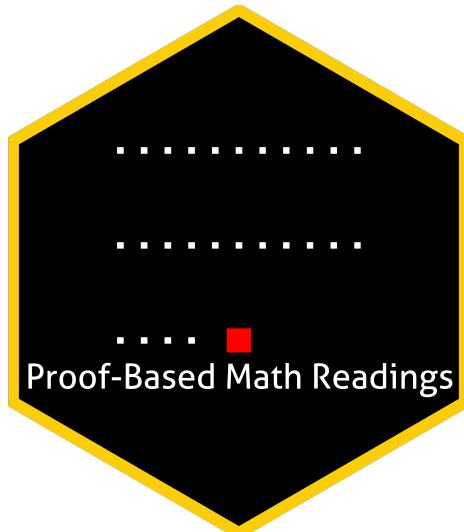
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Table of contents

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



*zekiakyol.com

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 6.2, 2025)
-  Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.2, 2025, 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 Galbaas)