

Proof-Based Math Readings

Session: Proof Techniques*

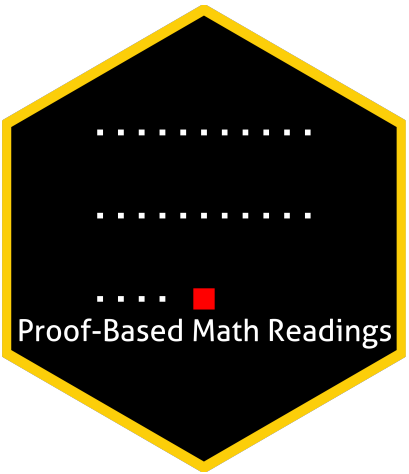
Zeki Akyol

Department of Economics
University of California, Santa Cruz
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*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 *Proof Techniques*.

1 Prerequisites and Format

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

2 Resources [All are open-access]

2.1 Main Book and Main Book's Playlist

Book of Proof - Richard Hammack (3.4 Edition, 2025) is our main book because it is a well-written and well-structured pedagogical masterpiece. It is also open-access and provides detailed solutions for odd-numbered exercises at the end of the book.

Jeremy Teitelbaum's playlist on Book of Proof is our main playlist because his narrative is great.

 **Book of Proof - Richard Hammack (3.4 Edition, 2025)**

 **Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Jeremy Teitelbaum, Chapters 1-12)**

2.2 Supplementary

2.2.1 Proof Techniques

Because our main playlist does not cover Chapters 13-14, we cover these chapters from Michael Penn's playlist.

 **Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Michael Penn, Chapters 1-14)**

 **Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Valerie Hower, Chapters 1-12)**

 **Book of Proof - Richard Hammack (3.4 Edition, 2025, Workbook by Justin Wright)**

 **Appendix A: Elements of Style for Proofs - Dana C. Ernst (2025)**

2.2.2 Calculus

 **Essence of Calculus - 3Blue1Brown (2023)**

  **Single Variable Calculus - David Jerison (2006)**

  **Multivariable Calculus - Denis Auroux (2007)**

 **Sequences and Series Calculator - Geogebra**

 **Function Graph - Geogebra**

3 Reading Schedule


- 1) Read the chapter and watch the matching playlist.
- 2) Solve the odd-numbered exercises and check their solutions at the end of the book.
- 3) Solve the even-numbered exercises and check their solutions using our unofficial solutions manual.
- 4) If stuck, ask questions in Discord.

Book of Proof

Week 01 


Chapter 1: Sets
Chapter 2: Logic
Chapter 3: Counting

Book of Proof

Week 02-03 

Chapter 4: Direct Proof
Chapter 5: Contrapositive Proof
Chapter 6: Proof by Contradiction

Book of Proof

Week 04-05 


Chapter 7: Proving Non-Conditional Statements
Chapter 8: Proofs Involving Sets
Chapter 9: Disproof

Book of Proof

Week 06 


Chapter 10: Mathematical Induction

Book of Proof

Week 07-08 


Chapter 11: Relations
Chapter 12: Functions

Book of Proof

Week 09-10 

Chapter 14: Cardinality of Sets (This chapter requires a solid understanding of Chapter 12)

Book of Proof

Week 11-12 

Chapter 13: Proofs in Calculus (This chapter is denser than the previous ones)

4 Further Readings (Optional)

 Mathematical Proofs - G. Chartrand, A. Polimeni, P. Zhang (Chapter 0-14, 4th Edition, 2018) 