Proof-Based Math Readings
Session: Proof Techniques*

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Version: 18 November 2025, 09:32 PM

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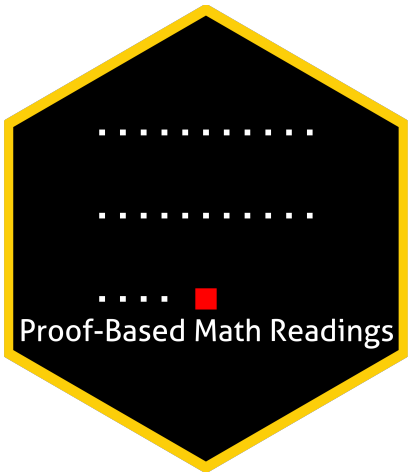

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0 Motivation

- *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)