

Proof-Based Math Readings

Session: Linear Algebra

2024 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 *Linear Algebra*.
- This session is dedicated to Sheldon Axler's lovely cat, 🐱 Moon, who passed away in August 2023.

1 Prerequisites

- CGPA: 3.00/4.00
- 📖 *Book of Proof* - Richard Hammack (3.3 Edition, 2022)
- ▶ *Linear Algebra* - Gilbert Strang (2005)
- Please use the 🔗 [Application Form](#) to join our reading group anytime.
- 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, and watch the chapter videos from the book's playlist.

3 Resources [All are open-access]

3.1 Main Book and Main Book's Playlist

Linear Algebra Done Right by Sheldon Axler is our main book for this session because it is well-written, well-structured, and open-access.

Robert Won's playlist is our main playlist because his narrative is just great.

- 📖 *Linear Algebra Done Right* - Sheldon Axler (4th Edition, 2024, Errata-free version)
- ▶ *Linear Algebra Done Right* - Sheldon Axler (4th Edition, 2024, Companion playlist by Robert Won)
- ▶ *Linear Algebra Done Right* - Sheldon Axler (4th Edition, 2024, Companion playlist by Sheldon Axler)
- ▶ *Linear Algebra Done Right* - Sheldon Axler (4th Edition, 2024, Solutions by MathwithoutCommentary)
- 📖 *Linear Algebra Done Right* - Sheldon Axler (3rd Edition, 2015, Solutions by linearalgebras)
- 📖 *Linear Algebra Done Right* - Sheldon Axler (3rd Edition, 2015, Solutions by jubnoske08)
- 📖 *Linear Algebra Done Right* - Sheldon Axler (3rd Edition, 2015, Solutions by solverer.com)

3.2 Supplementary

3.2.1 Linear Algebra

- ▶ *Essence of Linear Algebra* - 3Blue1Brown (2023)
- ▶ *Linear Algebra Done Right* - Sheldon Axler (3rd Edition, 2015, Companion playlist by Jason Morton)
- ▶ *Linear Algebra Done Right* - Sheldon Axler (3rd Edition, 2015, Companion playlist by Felix Leditzky)

3.2.2 Proof

- 📖 *Book of Proof* - Richard Hammack (3.3 Edition, 2022)
- ▶ *Book of Proof* - Richard Hammack (3.3 Edition, 2022, Companion playlist by Jeremy Teitelbaum, Chapter 1-12)
- ▶ *Book of Proof* - Richard Hammack (3.3 Edition, 2022, Companion playlist by Michael Penn, Chapter 1-14)

4 Reading Schedule

- LADR is the abbreviation of **Linear Algebra Done Right** - Sheldon Axler (4th Edition, 2024).

 LADR, Chapter 1: Vector Spaces	Week 01 
1A: \mathbf{R}^n and \mathbf{C}^n 1B: Definition of Vector Space 1C: Subspaces	
 LADR, Chapter 2: Finite-Dimensional Vector Spaces	Week 02-03 
2A: Span and Linear Independence 2B: Bases 2C: Dimension	
 LADR, Chapter 3: Linear Maps	Week 04-05-06 
3A: Vector Space of Linear Maps 3B: Null Spaces and Ranges 3C: Matrices 3D: Invertibility and Isomorphisms	
 LADR, Chapter 5: Eigenvalues and Eigenvectors	Week 07-08 
5A: Invariant Subspaces 5B: The Minimal Polynomial 5C: Upper-Triangular Matrices 5D: Diagonalizable Operators	
 LADR, Chapter 6: Inner Product Spaces	Week 09-10 
6A: Inner Products and Norms 6B: Orthonormal Bases 6C: Orthogonal Complements and Minimization Problems	
 LADR, Chapter 7: Operators on Inner Product Spaces	Week 11-12 
7A: Self-Adjoint and Normal Operators 7B: Spectral Theorem 7C: Positive Operators 7D: Isometries, Unitary Operators, and Matrix Factorization 7E: Singular Value Decomposition	