

Proof-Based Math Readings

Session: Linear Algebra

2024 Spring

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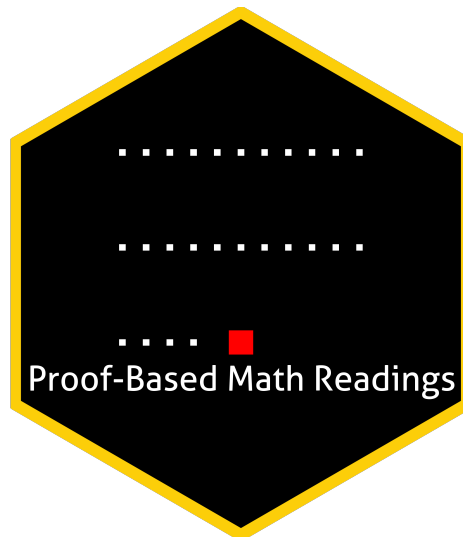
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0 Motivation

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

1 Prerequisites

- Proof Techniques resources below and 📺 [Linear Algebra - Gilbert Strang \(2005\)](#).
- 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 [All are open-access]

3.1 Main Book and Main Book's Playlist

Linear Algebra Done Right - Sheldon Axler (4th Edition, 2025, Errata-free version) 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 great.

- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Errata-free version\)](#)
- 📺 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Playlist by Robert Won\)](#)
- 📺 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Playlist by Sheldon Axler\)](#)
- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Notes by Robert Won\)](#)
- 📺 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Solutions by MathwithoutCommentary\)](#)
- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Solutions by Oliver Li\)](#)
- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2025, Solutions by nehc0\)](#)
- 📖 [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 \(3rd Edition, 2015, Solutions by Solverer\)](#)

3.2 Supplementary

3.2.1 Linear Algebra

- 📺 [Essence of Linear Algebra - 3Blue1Brown \(2023\)](#)
- 📺 [Linear Algebra Done Right - Sheldon Axler \(3rd Edition, 2015, Playlist by Jason Morton\)](#)
- 📖 [Down with Determinants! - Sheldon Axler \(1994\)](#)

3.2.2 Proof Techniques

- 📖 [Book of Proof - Richard Hammack \(3.3 Edition, 2022\)](#)
- 📺 [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Playlist by Jeremy Teitelbaum\)](#)
- 📺 [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Playlist by Michael Penn\)](#)

4 Reading Schedule


- LADR is the abbreviation of **Linear Algebra Done Right** - Sheldon Axler (4th Edition, 2025).

LADR, Chapter 1: Vector Spaces

Week 01 


- 1A \mathbb{R}^n and \mathbb{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

5 Further Readings (Optional)

-  Matrix Analysis - Roger A. Horn, Charles R. Johnson (2nd Edition, 2013)