Proof-Based Math Readings
Session: Linear Algebra
2024 Spring

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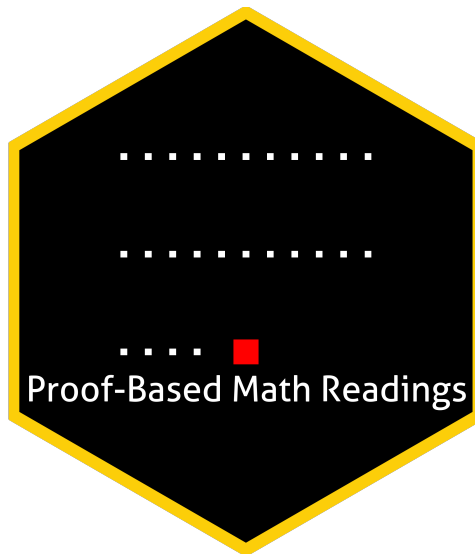
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Click here for the most recent versions of the syllabuses

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Table of contents

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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.
- Proof resources below and ▶ Linear Algebra - Gilbert Strang (2005) are the prerequisites for this session.
- 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 (4th Edition, 2024) 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, Playlist by Robert Won)
- ▶ Linear Algebra Done Right - Sheldon Axler (4th Edition, 2024, 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, Playlist by Jason Morton)
- ▶ Linear Algebra Done Right - Sheldon Axler (3rd Edition, 2015, 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, Playlist by Jeremy Teitelbaum, Chapter 1-12)
- ▶ Book of Proof - Richard Hammack (3.3 Edition, 2022, 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

5 Further Readings (Optional)

You can check out our Matrix Algebra syllabus at 🐙 github.com/zekiakyol/proof-based-math-readings