

# Proof-Based Math Readings

## Session: Linear Algebra

### 2024 Spring

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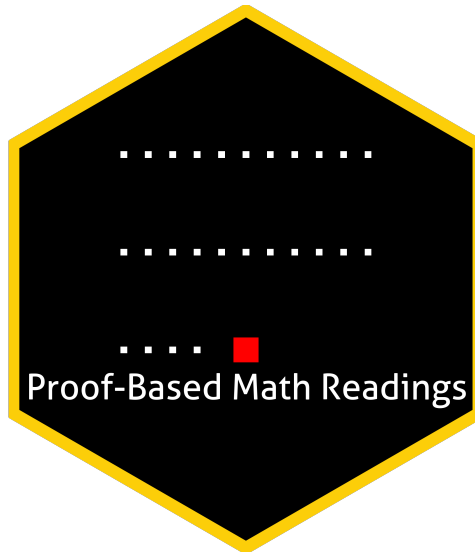
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## 0 Motivation

- *Proof-Based Math Readings* is a free 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 (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 \(4th Edition, 2024, Companion playlist by Robert Won\)](#)
- ▶ [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).

 <b>LADR, Chapter 1: Vector Spaces</b>	<b>Week 01</b> 
1A: $\mathbf{R}^n$ and $\mathbf{C}^n$ 1B: Definition of Vector Space 1C: Subspaces	
 <b>LADR, Chapter 2: Finite-Dimensional Vector Spaces</b>	<b>Week 02-03</b> 
2A: Span and Linear Independence 2B: Bases 2C: Dimension	
 <b>LADR, Chapter 3: Linear Maps</b>	<b>Week 04-05-06</b> 
3A: Vector Space of Linear Maps 3B: Null Spaces and Ranges 3C: Matrices 3D: Invertibility and Isomorphisms	
 <b>LADR, Chapter 5: Eigenvalues and Eigenvectors</b>	<b>Week 07-08</b> 
5A: Invariant Subspaces 5B: The Minimal Polynomial 5C: Upper-Triangular Matrices 5D: Diagonalizable Operators	
 <b>LADR, Chapter 6: Inner Product Spaces</b>	<b>Week 09-10</b> 
6A: Inner Products and Norms 6B: Orthonormal Bases 6C: Orthogonal Complements and Minimization Problems	
 <b>LADR, Chapter 7: Operators on Inner Product Spaces</b>	<b>Week 11-12</b> 
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](https://github.com/zekiakyol/proof-based-math-readings)