

# Proof-Based Math Readings

## Session: Linear Algebra

### 2024 Spring

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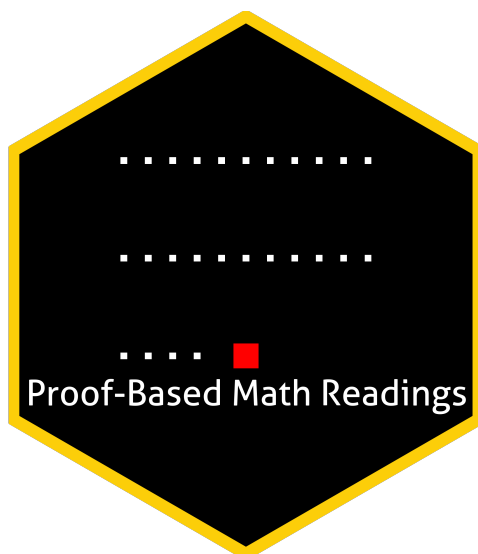
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Version: 14 October 2024, 06:46 PM

## Table of contents

<b>0 Motivation</b>	<b>2</b>
<b>1 Prerequisites</b>	<b>2</b>
<b>2 Format</b>	<b>2</b>
<b>3 Resources [All are open-access]</b>	<b>2</b>
3.1 Main Book and Main Book's Playlist . . . . .	2
3.2 Supplementary . . . . .	2
3.2.1 Linear Algebra . . . . .	2
3.2.2 Proof . . . . .	2
<b>4 Reading Schedule</b>	<b>3</b>
<b>5 Further Readings (Optional)</b>	<b>3</b>



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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.
- 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 - Sheldon Axler (4th Edition, 2024, 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 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 \(4th Edition, 2024, Notes by Robert Won\)](#)
- 📺 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2024, Solutions by MathwithoutCommentary\)](#)
- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2024, Solutions by Oliver Li\)](#)
- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2024, Solutions by neh0\)](#)
- 📖 [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

- 📖 [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, 2024).

 <b>LADR, Chapter 1: Vector Spaces</b>	<b>Week 01</b> 
1A $\mathbb{R}^n$ and $\mathbb{C}^n$ 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)

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