

# Proof-Based Math Readings

## Session: Matrix Algebra

### 2023 Fall

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Version: 29 October 2023, 07:29 PM

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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 *Matrix Algebra*.

## 1 Prerequisites

- CGPA: 3.00/4.00
-  [Book of Proof - Richard Hammack \(3.3 Edition, 2022\)](#)
-  [Linear Algebra - Gilbert Strang \(2005\)](#)
- Please use our  [Application Form](#) to join our reading group anytime.
- People who applied will be informed about their application results via email within a week.



## 2 Format

- This session will last 10 weeks from 23 October 2023 to 07 January 2024.
- We will discuss the topics/exercises that we struggle with at  [Proof-Based Math Readings \[Discord\]](#).
- We will not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters from the main book.

## 3 Resources



### 3.1 Main Book

**Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005)** is our main book because it is well-structured and well-written.

-  [Matrix Algebra - Karim M. Abadir, Jan R. Magnus \(2005\)](#)
-  [Matrix Algebra - Karim M. Abadir, Jan R. Magnus \(2005, Errata\)](#)

### 3.2 Supplementary

#### 3.2.1 Matrix Algebra

-  [Matrix Differential Calculus with Applications in Statistics and Econometrics - Jan R. Magnus, Heinz Neudecker \(3rd Edition, 2019\)](#)
-  [Econometric Theory - William H. Greene \(\*\*Appendix A\*\*, 8th Edition, 2020\)](#)

#### 3.2.2 Proof

In case we need to review a proof topic, we can use following book and its playlists.

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

## 4 Reading Schedule

- **MA** is the abbreviation of Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005) in the previous page.

### Week 01-02

📅 23 October - 05 November

- 📖 MA, Appendix B: Notation
- 📖 MA, Chapter 1: Vectors
- 📖 MA, Chapter 2: Matrices
- 📖 MA, Chapter 4: Rank, inverse, and determinant

### Week 03-04

📅 06 November - 19 November

- 📖 MA, Chapter 5: Partitioned matrices
- 📖 MA, Chapter 6: Systems of equations

### Week 05-06

📅 20 November - 03 December

- 📖 MA, Chapter 7: Eigenvalues, eigenvectors, and factorizations
- 📖 MA, Chapter 8: Positive (semi)definite and idempotent matrices

### Week 07-08

📅 04 December - 24 December

- 📖 MA, Chapter 10: Kronecker product, vec-operator, and Moore-Penrose inverse
- 📖 MA, Chapter 11: Patterned matrices: commutation- and duplication matrix

### Week 09-10

📅 25 December - 07 January

- 📖 MA, Chapter 12: Matrix inequalities
- 📖 MA, Chapter 13: Matrix calculus
- 📖 MA, Chapter 3: Vector spaces (Optional)

## 5 Further Readings (Optional)

If we want to read a more abstract book, the following book and its playlist are great.

- 📖 [Linear Algebra Done Right - Sheldon Axler \(4th Edition, 2024\)](#)
- ▶ [Linear Algebra Done Right - Sheldon Axler \(3rd Edition, 2015, Companion playlist to the book\)](#)

We also have a session on Linear Algebra at [github.com/zekiakyol/proof-based-math-readings](https://github.com/zekiakyol/proof-based-math-readings)