Proof-Based Math Readings Session: Matrix Algebra*
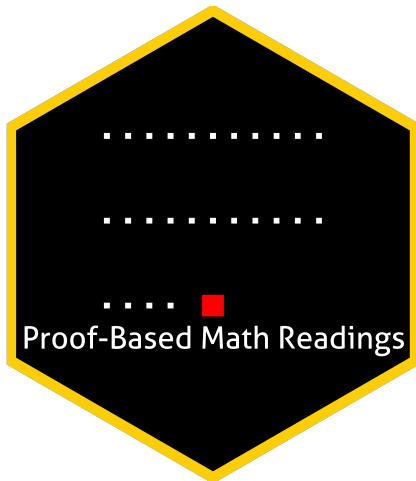
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Motivation

- *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 *Matrix Algebra.*

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.

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 📱.

Resources

Main Book

Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005) is our main book because it is well-written and well-structured. It also provides detailed solutions for the exercises.

📖 Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005)

📖 Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005, Errata)

Supplementary

Matrix Algebra

📜 A Gentle Introduction to Matrix Calculus - Jan R. Magnus (2024)

📖 The Matrix Cookbook - Kaare Brandt Petersen, Michael Syskind Pedersen (2012)

📄 [Econometric Theory - William H. Greene (Appendix A, 8th Edition, 2020)](#)

🔢 [matrixcalculus.org](#)

Proof Techniques

📄 [Book of Proof - Richard Hammack (3.4 Edition, 2025)](#)

▶️ [Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Jeremy Teitelbaum)](#)

▶️ [Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Michael Penn)](#)

Reading Schedule

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

📖 MA   **Week 01 📅**

Appendix A: Some mathematical tools

Appendix B: Notation

Chapter 1: Vectors

Chapter 2: Matrices

📖 MA   **Week 02 📅**

Chapter 3: Vector spaces

Chapter 4: Rank, inverse, and determinant

📖 MA   **Week 03-04 📅**

Chapter 5: Partitioned matrices

Chapter 6: Systems of equations

📖 MA   **Week 05-06 📅**

Chapter 7: Eigenvalues, eigenvectors, and factorizations

Chapter 8: Positive (semi)definite and idempotent matrices

Chapter 9: Matrix functions

📖 MA   **Week 07-08-09 📅**

Chapter 10: Kronecker product, vec-operator, and Moore-Penrose inverse

Chapter 11: Patterned matrices: commutation- and duplication matrix

📖 MA	**Week 10-11-12 📅**

> Chapter 12: Matrix inequalities
>
> Chapter 13: Matrix calculus

Further Readings (Optional)

> 📖 Matrix Differential Calculus with Applications in Statistics and Econometrics - Jan R. Magnus, Heinz Neudecker (3rd Edition, 2019)