Proof-Based Math Readings Session: Matrix Algebra*
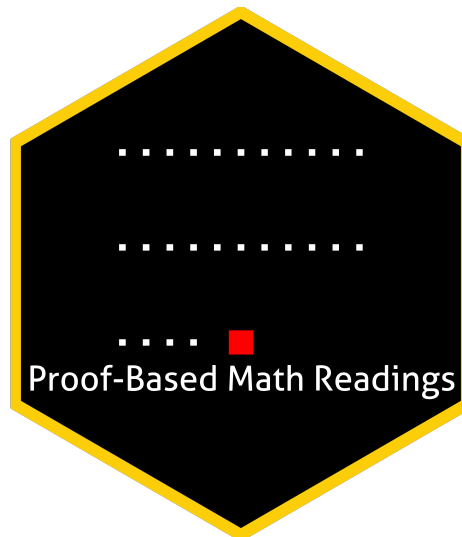
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0 Motivation

- *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*.

1 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.

2 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 🎮.

3 Resources

3.1 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)

3.2 Supplementary

3.2.1 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

3.2.2 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)

4 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

5 Further Readings (Optional)

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