Proof-Based Math Readings
Session: Matrix Algebra*

Zeki Akyol
Department of Economics
Istanbul Technical University
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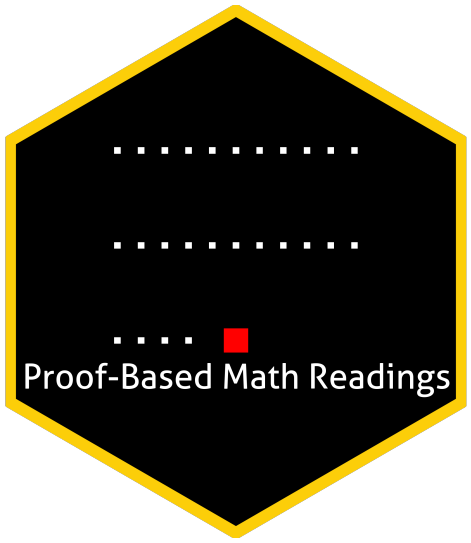

*zekiakyol.com

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)