Proof-Based Math Readings
Session: Matrix Algebra
2023 Fall

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Click here for the most recent versions of the syllabuses

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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.
- Applicants will be informed about their application results within a week via email.

2   Format

- This session will last 10 weeks.
- 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 abrevviation 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 07-08-09 📅 **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 10-11-12 📅 **25 December - 14 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 (4th Edition, 2024, Companion playlist to the book)

    We also have a session on Linear Algebra at github.com/zekiakyol/proof-based-math-readings