Proof-Based Math Readings
Session: Matrix Calculus
2023 Fall

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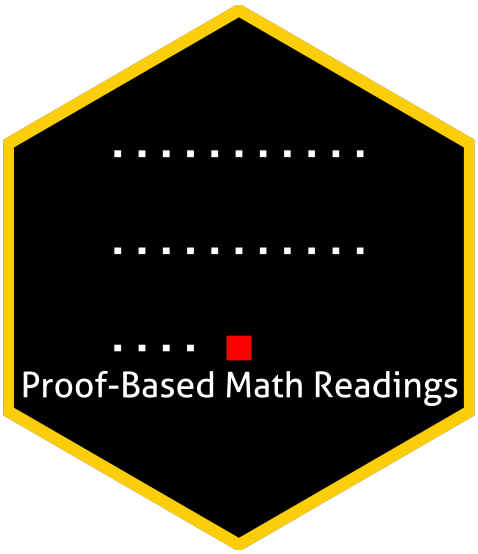

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0 Motivation

- *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 Calculus*.

1 Prerequisites

- CGPA: 3.00/4.00, Book of Proof - Richard Hammack (3.3 Edition), Linear Algebra - Gilbert Strang (2005)
- Please apply by uploading your CV and transcript to this Google Form until 23:59, 18 October 2023.
  Please upload your CV and transcript as **NameSurname.pdf**, not **CV.pdf**.
  Students who applied will be informed about their application results via email at 10:00, 20 October 2023.

2 Format

- This session will last 10 weeks from 30 October 2023 to 14 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 size of the group.
- Members are expected to read the chapters from the book.

3 Resources [All are open-access]

3.1 Main Book

Matrix Algebra - Karim M. Abadir, Jan R. Magnus (2005) is our main book because it is a 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)

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 — **30 October - 12 November**

- MA, Appendix B: Notation
- MA, Chapter 1: Vectors
- MA, Chapter 2: Matrices
- MA, Chapter 3: Vector spaces
- MA, Chapter 4: Rank, inverse, and determinant

Week 03-04 — **13 November - 26 November**

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

Week 05-06 — **27 November - 10 December**

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

Week 07-08 — **11 December - 31 December**

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

Week 09-10 — **01 January - 14 January**

- MA, Chapter 12: Matrix inequalities
- MA, Chapter 13: Matrix calculus

5 Further Readings & Playlists (Optional)

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

- Linear Algebra Done Right - Sheldon Axler (4th Edition, 2023, Forthcoming)
- Linear Algebra Done Right - Sheldon Axler (3rd Edition, 2015, Companion playlist to the book)