

Proof-Based Math Readings

Session: Measure Theory

2025 Summer

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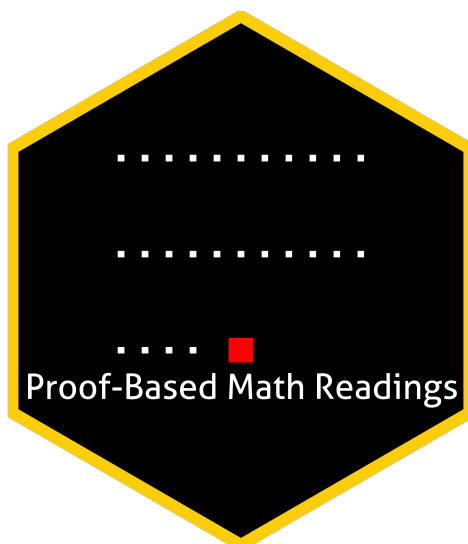
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0 Motivation

- *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 *Measure Theory*.

1 Prerequisites

- CGPA: 3.00/4.00.
- Proof and Real Analysis books/playlists below are the prerequisites for this session.
- Please use the  **Application Form** to join our reading group anytime.
- Applicants are informed about their application results within a week via email.

2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at  **Proof-Based Math Readings [Discord]**.
- We do not have face-to-face/online meetings due to the size of the group.
- Members are expected to read the chapters, and watch the chapter videos from the book's playlist.

3 Resources

3.1 Main Book and Main Book's Playlist

Measure, Integration & Real Analysis by Sheldon Axler is our main book for this session because it is well-written, well-structured, and open-access.

- 📖 **Measure, Integration & Real Analysis - Sheldon Axler (2023, Errata-free version)**
- ▶ **Measure, Integration & Real Analysis - Sheldon Axler (2023)** → will be added after the 2nd edition.

3.2 Supplementary

3.2.1 Measure Theory

- ▶ **Measure Theory - The Bright Side of Mathematics (2024)**
- ▶ **Measure Theory - Indrava Roy (2020)**

3.2.2 Topology

- 📖 **Schaum's Outline of General Topology - Seymour Lipschutz (2011)**
- ▶ **General Topology - Bernard Badzioch (2020)**
- ▶ **Topology - Bruno Zimmermann (2016, Video 1-15)**

3.2.3 Proof

- 📖 **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)**

3.2.4 Real Analysis

- 📖 **Measure, Integration & Real Analysis - Sheldon Axler (2023, Supplement)**
- 📖 **Basic Analysis I: Introduction to Real Analysis [Volume I] - Jiri Lebl (Version 6.0, 2023)**
- ▶ **Real Analysis - Casey Rodriguez (2020, Companion playlist to Basic Analysis I)**
- ▶ **Introduction To Metric Spaces - Paige Bright (2023)**

4 Reading Schedule


- MIRA is the abbreviation of **Measure, Integration & Real Analysis** - Sheldon Axler (2023).

MIRA, Chapter 1: Riemann Integration

Week 01 


- 1A Review: Riemann Integral
- 1B Riemann Integral Is Not Good Enough

MIRA, Chapter 2: Measures

Week 02-03-04-05 

- 2A Outer Measure on \mathbf{R}
- 2B Measurable Spaces and Functions
- 2C Measures and Their Properties
- 2D Lebesgue Measure
- 2E Convergence of Measurable Functions

MIRA, Chapter 3: Integration

Week 06-07-08 


- 3A Integration with Respect to a Measure
- 3B Limits of Integrals & Integrals of Limits

MIRA, Chapter 4: Differentiation

Week 09 

- 4A Hardy–Littlewood Maximal Function
- 4B Derivatives of Integrals

MIRA, Chapter 5: Product Measures

Week 10-11-12 

- 5A Products of Measure Spaces
- 5B Iterated Integrals
- 5C Lebesgue Integration on \mathbf{R}^n