# Proof-Based Math Readings
# Session: Measure Theory
2025 Summer

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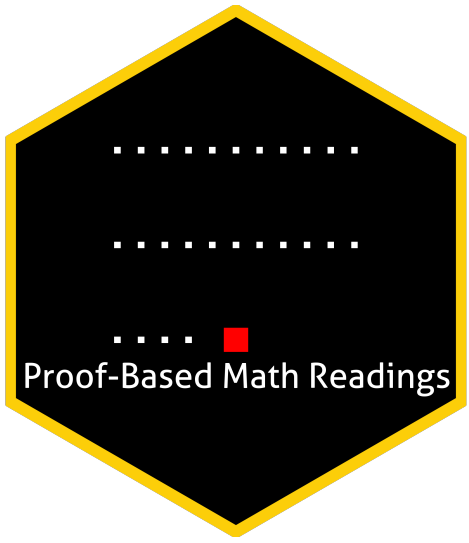


*zekiakyol.com

# 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 Techniques, Real Analysis, and Topology resources below.
- 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.
- We discuss the topics and exercises at Proof-Based Math Readings [Discord].
- 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 (2024, Errata-free version)
- Measure, Integration & Real Analysis - Sheldon Axler (202X) → 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)
- A horizontal integral?! Introduction to Lebesgue Integration - vcubingx (2020)

### 3.2.2 Proof Techniques

- Book of Proof - Richard Hammack (3.3 Edition, 2022)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Jeremy Teitelbaum)
- Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Michael Penn)

### 3.2.3 Real Analysis

- Measure, Integration & Real Analysis - Sheldon Axler (2024, Supplement)
- Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.1, 2024)
- Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.1, 2024, Playlist by Casey Rodriguez)
- Introduction To Metric Spaces - Paige Bright (2023)

# 4 Reading Schedule

- **MIRA** is the abbreviation of **Measure, Integration & Real Analysis - Sheldon Axler (2024)**.

**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 $\mathbf{R}^n$

# 5 Further Readings (Optional)

Our Measure Theoretic Probability syllabus at github.com/zekiakyol/proof-based-math-readings