

# Proof-Based Math Readings

## Session: Measure Theory

2025 Summer

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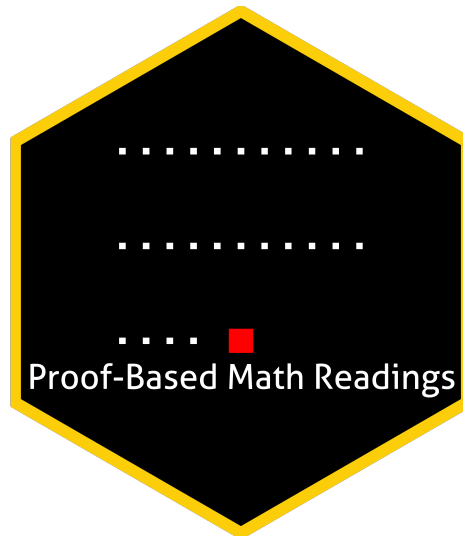
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\*[zekiakyol.com](http://zekiakyol.com)


## 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 *Measure Theory*.

## 1 Prerequisites

- 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.
- Members read the main book and discuss the topics/exercises in the Proof-Based Math Readings Discord .

## 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)**
- ▶ **The Lebesgue Integral - BBC (1975)**

#### 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 **M**easure, **I**ntegration & **R**eal 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](https://github.com/zekiakyol/proof-based-math-readings)