

Proof-Based Math Readings

Session: Measure Theory*

Zeki Akyol

Department of Economics
Istanbul Technical University
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Table of contents

0	Motivation	2
1	Prerequisites	2
2	Format	2
3	Resources	2
3.1	Main Book and Main Book's Playlist	2
3.2	Supplementary	2
3.2.1	Measure Theory	2
3.2.2	Proof Techniques	2
3.2.3	Real Analysis	2
4	Reading Schedule	3
5	Further Readings (Optional)	3




*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 - Sheldon Axler (2025, Errata-free version) is our main book for this session because it is well-written, well-structured, and open-access.

- 📖 **Measure, Integration & Real Analysis - Sheldon Axler (2025, 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 (2025)**
- ▶ **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 (3.4 Edition, 2025)**
- ▶ **Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Jeremy Teitelbaum)**
- ▶ **Book of Proof - Richard Hammack (3.4 Edition, 2025, Playlist by Michael Penn)**

3.2.3 Real Analysis

- 📖 **Measure, Integration & Real Analysis - Sheldon Axler (2025, Supplement)**
- 📖 **Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.2, 2025)**
- ▶ **Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.2, 2025, 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 (2025).

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