# Proof-Based Math Readings Session: Topology\*

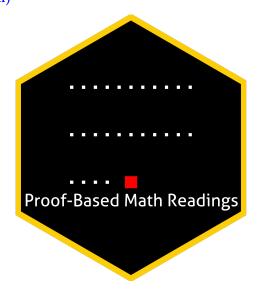
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<sup>\*</sup>zekiakyol.com

### 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 Topology.

### 1 Prerequisites

- Proof Techniques and Real Analysis 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

Topology - James Munkres (2nd Edition, 2014) is our main book for this session because it is well-written, well-structured, and has plenty of intuitive figures.

- Topology James Munkres (2nd Edition, 2014)
- Topology James Munkres (2nd Edition, 2014, Playlist by Bruno Zimmermann, Video 1-15)
- Topology James Munkres (2nd Edition, 2014, Solutions for Chapter 1-2 by Dan Whitman)
- Topology James Munkres (2nd Edition, 2014, Solutions for Chapter 1-2 by solverer)
- Topology James Munkres (2nd Edition, 2014, Solutions for Chapter 2-3 by positron0802)
- Topology James Munkres (2nd Edition, 2014, Solutions for Chapter 1-2-3-4 by dbFin)

#### 3.2 Supplementary

#### 3.2.1 Topology

- $\blacksquare$  Schaum's Outline of General Topology Seymour Lipschutz (2011)  $\rightarrow$  Beginner friendly and contains solutions
- Topology Without Tears Sidney A. Morris (2024)
- $\rightarrow$  Beginner friendly and open-access

- General Topology Bernard Badzioch (2020)
- Intuitive Topology Troy Kling (2021)
- Topology Marius Furter (2022)
- Topology Michael Penn (2025)

#### 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)

#### 3.2.3 Real Analysis

- 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)

#### Reading Schedule 4

TM is the abbreviation of Topology - James Munkres (2nd Edition, 2014).

### ■ TM, Chapter 1: Set Theory and Logic

Week 01

- 1 Fundamental Concepts
- 2 Functions
- 3 Relations
- 4 The Integers and the Real Numbers
- **5** Cartesian Products
- 6 Finite Sets
- 7 Countable and Uncountable Sets
- 8 The Principle of Recursive Definition
- 9 Infinite Sets and the Axiom of Choice
- 10 Well-Ordered Sets
- 11 The Maximum Principle

### **TM**, Chapter 2: Topological Spaces and Continuous Functions

Week 02-03-04-05-06



- 12 Topological Spaces
- 13 Basis for a Topology
- 14 The Order Topology
- 15 The Product Topology on  $X \times Y$
- 16 The Subspace Topology
- 17 Closed Sets and Limit Points
- 18 Continuous Functions
- 19 The Product Topology
- 20 The Metric Topology
- 21 The Metric Topology (continued)

#### ■ TM, Chapter 3: Connectedness and Compactness

Week 07-08-09-10-11-12



- 23 Connected Spaces
- 24 Connected Subspaces of the Real Line
- 25 Components and Local Connectedness
- 26 Compact Spaces
- 27 Compact Subspaces of the Real Line
- 28 Limit Point Compactness
- 29 Local Compactness

#### Further Readings (Optional) 5

Our Measure Theory and Measure Theoretic Probability syllabuses at Ogithub.com/zekiakyol/proofbased-math-readings