

Proof-Based Math Readings

Session: Topology

2023 Winter

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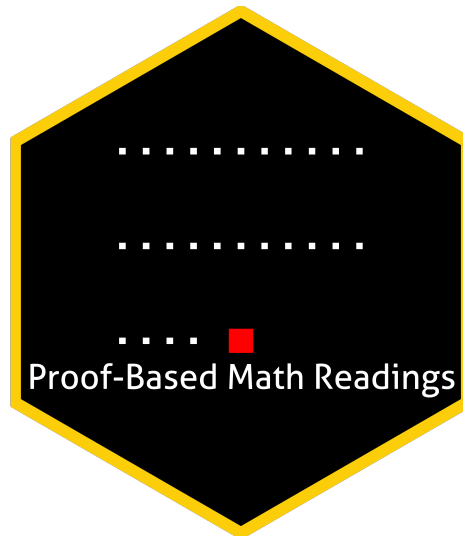
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0 Motivation

- *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

-  Schaum's Outline of General Topology - Seymour Lipschutz (2011) → Beginner friendly and contains solutions
-  Topology Without Tears - Sidney A. Morris (2024) → 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 (3.3 Edition, 2022)
-  Book of Proof - Richard Hammack (3.3 Edition, 2022, 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)

4 Reading Schedule


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 

- 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

TM, Chapter 4: Countability and Separation Axioms

Week 12 

- 30 The Countability Axioms
- 31 The Separation Axioms

5 Further Readings (Optional)

Our Measure Theory and Measure Theoretic Probability syllabuses at github.com/zekiakyol/proof-based-math-readings