Proof-Based Math Readings
Session: Topology
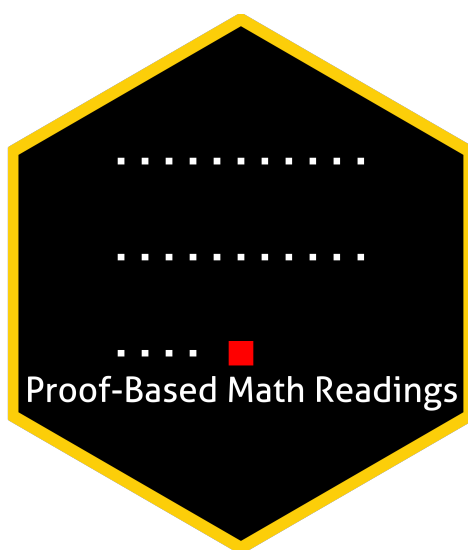## 2023 Winter

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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 *Topology*.

1 Prerequisites

- CGPA: 3.00/4.00.
- Proof and Real Analysis resources below are the prerequisites for this session.
- Please use the 🔗 Application Form to join our reading group.
- Applicants are informed about their application results within a week via email.

2 Format

- This session takes 12 weeks.
- We discuss the topics/exercises that we struggle with at 💬 Proof-Based Math Readings [Discord].
- We do not have face-to-face/online meetings due to the size of the group.
- 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

Topology (2nd Edition, 2014) by James Munkres is our main book for this session because it is well-written, well-structured, and has plenty of intuitive figures.
Bruno Zimmermann's playlist is our main playlist because his narrative is just great.

- 📖 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

We use **Schaum's Outline of General Topology** for exercises because it has solutions for all 391 exercises.

- 📖 Schaum's Outline of General Topology - Seymour Lipschutz (2011) → Beginner friendly

- 📖 Topology Without Tears - Sidney A. Morris (2023)   → Beginner friendly and open-access

- ▶️ General Topology - Bernard Badzioch (2020)

- ▶️ Intuitive Topology - Troy Kling (2021)

- ▶️ Topology - Marius Furter (2022)

3.2.2 Proof

- 📖 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

- 📖 Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023)

- ▶️ Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023, 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** 📅

    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 06-07-08-09** 📅

    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 10-11-12** 📅

    30 The Countability Axioms
    31 The Separation Axioms
    32 Normal Spaces
    33 The Urysohn Lemma
    34 The Urysohn Metrization Theorem

5   Further Readings (Optional)

You can check out our Measure Theory and Measure Theoretic Probability syllabuses at github.com/zekiakyol/proof-based-math-readings