

# Proof-Based Math Readings

## Session: Topology

2023 Winter

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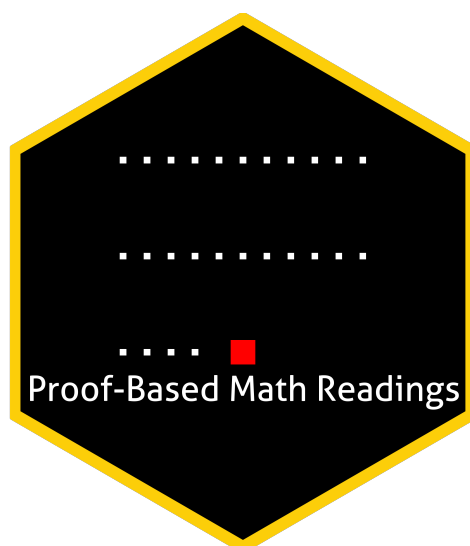
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## Table of contents

<b>0</b>	<b>Motivation</b>	<b>2</b>
<b>1</b>	<b>Prerequisites</b>	<b>2</b>
<b>2</b>	<b>Format</b>	<b>2</b>
<b>3</b>	<b>Resources</b>	<b>2</b>
3.1	Main Book and Main Book's Playlist . . . . .	2
3.2	Supplementary . . . . .	2
3.2.1	Topology . . . . .	2
3.2.2	Proof . . . . .	2
3.2.3	Real Analysis . . . . .	2
<b>4</b>	<b>Reading Schedule</b>	<b>3</b>




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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 and Proof and Real Analysis books/playlists listed below.
- Please use the  [Application Form](#) to join our reading group anytime.
- 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 \(2nd Edition, 2014, Companion playlist by Bruno Zimmermann, Video 1-15\)](#)
-  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 math.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 \(2022\)](#)
-  [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 \(3.3 Edition, 2022, Companion playlist by Jeremy Teitelbaum\)](#)
-  [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Companion playlist by Michael Penn\)](#)


#### 3.2.3 Real Analysis

-  [Basic Analysis I: Introduction to Real Analysis \[Volume I\] - Jiri Lebl \(Version 6.0, 2023\)](#)
-  [Real Analysis - Casey Rodriguez \(2020, Companion playlist to Basic Analysis I\)](#)
-  [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