

# Proof-Based Math Readings

## Session: Real Analysis

### 2023 Summer

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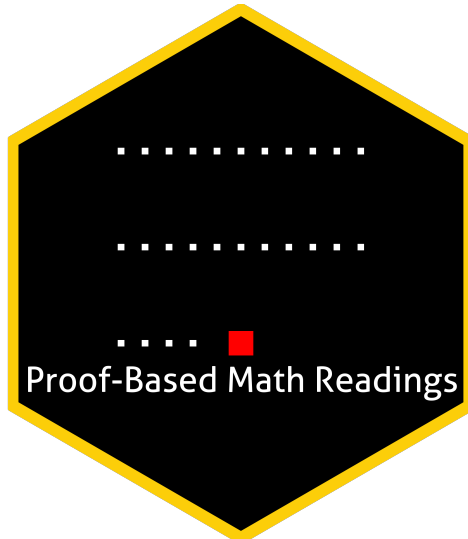
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## 0 Motivation

- *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 *Real Analysis*.

## 1 Prerequisites

- CGPA: 3.00/4.00.
- Proof 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 [All are open-access]

### 3.1 Main Book and Main Book's Playlist





**Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023)** is our main book for this session because it is well-written, well-structured, and open-access.

Casey Rodriguez's playlist is our main playlist because his narrative is just great.





-  **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)**
-  **Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023, Notes by Casey Rodriguez)**

### 3.2 Supplementary

#### 3.2.1 Real Analysis

-  **Real Analysis - Wrath of Math (2024)** → Start with this playlist if you find the main book challenging
-  **Real Analysis - Michael Penn (2021)**
-  **Understanding Analysis - Stephen Abbott (2nd Edition 2016, Playlist by Marc Renault)**
-  **Understanding Analysis - Stephen Abbott (2nd Edition 2016, Solutions by Ulisse Mini, Jesse Liby)**

#### 3.2.2 Calculus

-  **Essence of Calculus - 3Blue1Brown (2023)**
-   **Single Variable Calculus - David Jerison (2006) and Multivariable Calculus - Denis Auroux (2007)**
-  **Sequences and Series Calculator - Geogebra and Function Graph - Geogebra**


#### 3.2.3 Proof

-  **Book of Proof - Richard Hammack (3.3 Edition, 2022)**
-  **Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Jeremy Teitelbaum, Chapters 1-12)**
-  **Book of Proof - Richard Hammack (3.3 Edition, 2022, Playlist by Michael Penn, Chapters 1-14)**

## 4 Reading Schedule

- **BAI** is Basic Analysis I: Introduction to Real Analysis - Jiri Lebl (Version 6.0, 2023).
- We use Understanding Analysis - Stephen Abbott (2nd Edition 2016, Solutions) for exercises.

### **BAI, Chapter 0: Introduction**

Week 01 


List of Notation (Page 309-312)

0.1 About this book

0.2 About analysis

0.3 Basic set theory

### **BAI, Chapter 1: Real Numbers**

Week 02 


1.1 Basic properties

1.2 The set of real numbers

1.3 Absolute value and bounded functions

1.4 Intervals and the size of  $\mathbb{R}$

### **BAI, Chapter 2: Sequence and Series**

Week 03-04-05 

2.1 Sequences and limits


2.2 Facts about limits of sequences

2.3 Limit superior, limit inferior, and Bolzano-Weierstrass

2.4 Cauchy sequences

2.5 Series

### **BAI, Chapter 3: Continuous Functions**

Week 06-07-08 


3.1 Limits of functions

3.2 Continuous functions

3.3 Extreme and intermediate value theorems

3.4 Uniform continuity

### **BAI, Chapter 4: The Derivative**


Week 09-10 

4.1 The derivative

4.2 Mean value theorem

4.3 Taylor's theorem

### **BAI, Chapter 5: The Riemann Integral**

Week 11-12 

5.1 The Riemann integral

5.2 Properties of the integral

5.3 Fundamental theorem of calculus

## 5 Further Readings (Optional)

 [Introduction To Metric Spaces - Paige Bright \(2023\)](#)