

Proof-Based Math Readings

Session: Real Analysis

2023 Fall

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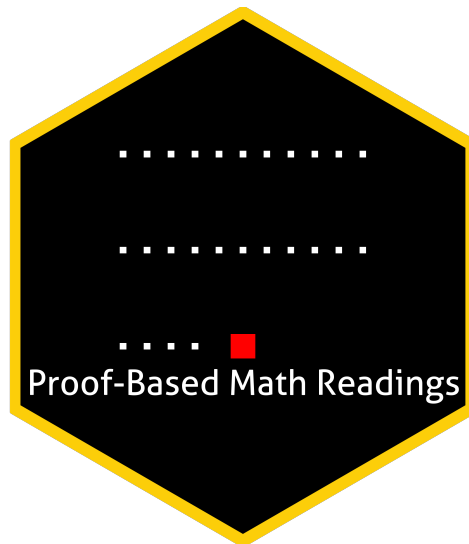
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Version: 26 August 2023, 04:44 PM

Table of contents

0	Motivation	2
1	Prerequisites	2
2	Format	2
3	Resources [All are open-access]	2
3.1	Main Book and Main Book's Playlist	2
3.2	Supplementary	2
3.2.1	Real Analysis	2
3.2.2	Calculus	2
3.2.3	Proof	2
4	Reading Schedule	3



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 and **Book of Proof - Richard Hammack (3.3 Edition, 2022)**.
- Please apply by uploading your CV and transcript to this [📄 Google Form](#) until 23:59, 28 July 2023. Please upload your CV and transcript as **NameSurname.pdf**, not **CV.pdf**. Students who applied will be informed about their application results via email at 10:00, 30 July 2023.

2 Format

- This session will last 13 weeks from 31 July 2023 to 29 October 2023.
- We will discuss the topics/exercises that we struggle with at [🗨️ Proof-Based Math Readings \[Discord\]](#).
- We will not have face-to-face/online meetings due to 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 [Volume I] by Jiri Lebl 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 \[Volume I\] - Jiri Lebl \(Version 6.0, 2023\)](#)
- ▶ [Real Analysis - Casey Rodriguez \(2020, Companion playlist to the main book\)](#)
- 📖 [Real Analysis - Casey Rodriguez \(2020, Companion notes to the main book\)](#)

3.2 Supplementary

3.2.1 Real Analysis

- ▶ [Real Analysis - Michael Penn \(2021\)](#)
- ▶ [Real Analysis - Wrath of Math \(2023\)](#)
- ▶ [Understanding Analysis - Stephen Abbott \(2nd Edition 2016, Playlist by Marc Renault\)](#)
- 📖 [Understanding Analysis - Stephen Abbott \(2nd Edition 2016, Solutions by Ulisse Mini, Jesse Liby\)](#)
- ▶ [Introduction To Metric Spaces - Paige Bright \(2023\)](#)

3.2.2 Calculus

- ▶ [Essence of Calculus - 3Blue1Brown \(2023\)](#)
- 📖 ▶ [Single Variable Calculus - David Jerison \(2006\) and Multi Variable Calculus - Denis Auroux \(2007\)](#)
- 📱 [Geogebra - Sequences and Series Calculator](#) and [Geogebra - Function Graph](#)

3.2.3 Proof

- 📖 [Book of Proof - Richard Hammack \(3.3 Edition, 2022\)](#)
- ▶ [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Companion playlist by Jeremy Teitelbaum, Chapter 1-12\)](#)
- ▶ [Book of Proof - Richard Hammack \(3.3 Edition, 2022, Companion playlist by Michael Penn, Chapter 1-14\)](#)

4 Reading Schedule

- **BAI** is the abbreviation of Basic Analysis I: Introduction to Real Analysis [Volume I] - Jiri Lebl (Version 6.0, 2023) in the previous page.
- We use Understanding Analysis - Stephen Abbott (2nd Edition 2016, Solutions) for exercises.

Week 01-02-03-04

📅 31 July - 27 August

- 📖 **BAI, List of Notation** (Page 309-312)
- 📖 **BAI, Chapter 0: Introduction**
 - BAI, Chapter 0.1: About this book
 - BAI, Chapter 0.2: About analysis
 - BAI, Chapter 0.3: Basic set theory
- 📖 **BAI, Chapter 1: Real Numbers**
 - BAI, Chapter 1.1: Basic properties
 - BAI, Chapter 1.2: The set of real numbers
 - BAI, Chapter 1.3: Absolute value and bounded functions
 - BAI, Chapter 1.4: Intervals and the size of \mathbb{R}
 - BAI, Chapter 1.5: Decimal representation of the reals

Week 05-06

📅 28 August - 10 September

- 📖 **BAI, Chapter 2: Sequence and Series**
 - BAI, Chapter 2.1: Sequences and limits
 - BAI, Chapter 2.2: Facts about limits of sequences
 - BAI, Chapter 2.3: Limit superior, limit inferior, and Bolzano-Weierstrass
 - BAI, Chapter 2.4: Cauchy sequences
 - BAI, Chapter 2.5: Series
 - BAI, Chapter 2.6: More on series

Week 07-08

📅 11 September - 24 September

- 📖 **BAI, Chapter 3: Continuous Functions**
 - BAI, Chapter 3.1: Limits of functions
 - BAI, Chapter 3.2: Continuous functions
 - BAI, Chapter 3.3: Extreme and intermediate value theorems
 - BAI, Chapter 3.4: Uniform continuity

Week 09-10-11

📅 25 September - 15 October

- 📖 **BAI, Chapter 4: The Derivative**
 - BAI, Chapter 4.1: The derivative
 - BAI, Chapter 4.2: Mean value theorem
 - BAI, Chapter 4.3: Taylor's theorem
- 📖 **BAI, Chapter 5: The Riemann Integral**
 - BAI, Chapter 5.1: The Riemann integral
 - BAI, Chapter 5.2: Properties of the integral
 - BAI, Chapter 5.3: Fundamental theorem of calculus

Week 12-13

📅 16 October - 29 October

- 📖 **BAI, Chapter 6: Sequence of Functions**
 - BAI, Chapter 6.1: Pointwise and uniform convergence
 - BAI, Chapter 6.2: Interchange of limits