Proof-Based Math Readings
Session: Real Analysis
2023 Summer

Zeki Akyol*
Department of Economics
Istanbul Technical University
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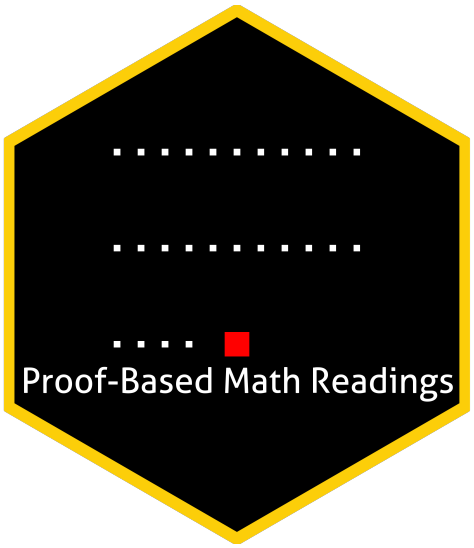

*zekiakyol.com

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 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 [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)
- 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, 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 Basic Analysis I: Introduction to Real Analysis [Volume I] - 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