1 Introduction

McMaster University

Mathematics and Statistics

$$\int_M d\omega = \int_{\partial M} \omega$$

Mathematics 3A03
Real Analysis I

Instructor: David Earn

Lecture 1
Introduction
Tuesday 6 January 2026

If you haven't already, please fill in Math 3A03 Survey 1 on childsmath

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Survey 1**
- Submit.

Where to find course information

- The course web site: http://ms.mcmaster.ca/earn/3A03
- Click on Course syllabus to view the basic course information.
  - *You are expected to read and pay attention to every word of the syllabus.*
  - *Note that some items in the syllabus are tentative and might be updated.*
- Let's have a look now...

What you are assumed to know

Chapters 1–5 of Bartle and Sherbert (BS), *Introduction to Real Analysis*

- The Real Numbers, $\mathbb{R}$ (BS Chapter 2)
- Sequences and Series (BS Chapter 3)
- Limits of functions (BS Chapter 4)
- Continuous functions (BS Chapter 5)

Let's do a few polls to trigger your memory...

Background Poll: Characteristic property of $\mathbb{R}$

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Background: The property that characterizes $\mathbb{R}$ in comparison with $\mathbb{Q}$**
- Submit.

Background Poll: Sequence limit order

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Background: Sequence limit order**
- Submit.

Background Poll: Monotone convergence

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Background: Monotone convergence**
- Submit.

Background Poll: Intermediate and extreme values

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Background: Intermediate and extreme values**
- Submit.

Background / reminder

Definition (Cauchy sequence)

A sequence $\{s_n\}$ is said to be a ***Cauchy sequence*** iff for all $\varepsilon > 0$ there exists $N \in \mathbb{N}$ such that if $m \geq N$ and $n \geq N$ then $|s_n - s_m| < \varepsilon$.

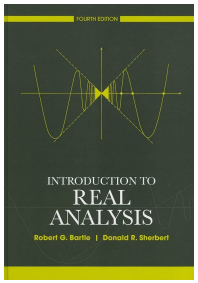
Poll: another background check

- Go to
  https://www.childsmath.ca/childsa/forms/main_login.php
- Click on Math 3A03
- Click on Take Class Poll
- Fill in poll **Background: Cauchy sequences**
- Submit.

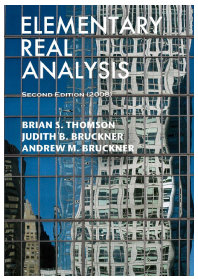
What we will cover in this course

Primary sources

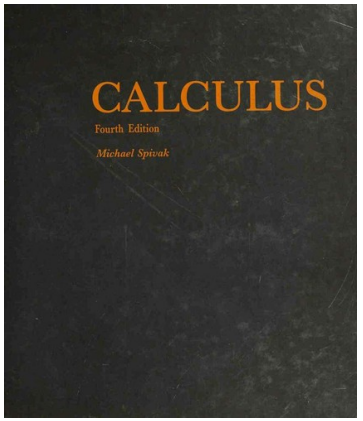
- ***Second half of Math 3IA3 textbook:***
  Bartle and Sherbert (BS),
  Introduction to Real Analysis



- ***Online textbook:***
  Thomson, Bruckner and Bruckner (TBB),
  Elementary Real Analysis



- ***Optional book:***
  Michael Spivak, "Calculus" (4^{th} ed., 2008)
  - This book is not sufficiently advanced for this course, but the exposition of elementary analysis is very nice.
  - It is a great read, and if you read it you'll see some of the things that inspire some aspects of my presentation style.



What we will cover in this course

Primary topics

- ***Differentiation***
  (BS Chapter 6) (TBB Chapter 7)
- ***Integration***
  (BS Chapter 7) (TBB Chapter 8)
- ***Topology of the real line***
  (BS Chapter 11) (TBB Chapter 4)
- ***Sequences and series of functions***
  (BS Chapters 8 and 9) (TBB Chapter 9)
- ***Metric spaces***
  (TBB Chapter 13)

Survey

If you haven't already, please complete the "Survey 1" poll on childsmath.

In addition to doing the survey, please e-mail me (now or at any point in the term) with any preferences or suggestions you have about how to run the course.

Questions

Questions?