UBC MATH_V 320: Real Variables I

Syllabus for Autumn 2025

Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (Musqueam). The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on culture, history, and traditions from one generation to the next.

If you would like to know more about the joint history of UBC and Musqueam, one place to start is at UBC's Indigenous Portal.

Resources

New material will be added to the Canvas page throughout the term. Please check back regularly.

The most important resources are the weekly problem sets. Find these under the link for Assignments. Supporting information is provided in lectures, in the reference books. The instructor's notes are on the Resources page.

If you have questions, please ask them on the dedicated Piazza page for MATH 320. It's very likely that some of your colleagues will be interested in them too. For this reason, Prof Loewen prefers to reply on Piazza instead of answering a direct email. (Of course, direct email is appropriate for a private conversation about issues unique to you--like illness, CFA details, missing class, etc. Please use loew@math.ubc.ca instead of the built-in Canvas messaging system.)

Calendar Description

MATH 320 (3) Real Variables I The real number system; real Euclidean *n*-space; open, closed, compact, and connected sets; Bolzano-Weierstrass theorem; sequences and series. Continuity and uniform continuity. Differentiability and mean-value theorems. [3-0-0]
Prerequisite: Either (a) a score of 68% or higher in MATH 226 or (b) one of MATH 200, MATH 217, MATH 226, MATH 253, MATH 254 and a score of 80% or higher in MATH 220.

Instructor and Office Hours

Philip D Loewen, loew@math.ubc.ca, room MATH 207. Drop-in office hours (no appointment necessary, but be prepared to share):

- Mondays 13:30-14:30 in room MATH 207
- Wednesdays 13:30-14:30 in room MATH 207
- Tuesdays 16:30-17:30 on Zoom, meeting details provided on Canvas. (Please don't share them with anybody who is not registered in the class.)

Appointments outside these times can be arranged. Please send an email that includes your availability if you want to arrange one. Office hours are cancelled on days when UBC is closed, and during the Autumn Break.

Class Meetings

MWF 12:00-12:50, in room BUCH A203

Important Dates

- 03 September (Wed)–First class of the term.
- 15 September (Mon)–UBC's deadline for registration changes.
- 29 September (Tue)–Indigenous Reconciliation Day, UBC Closed.
- 13 October (Mon)–Thanksgiving Day, UBC Closed.
- **17 October (Fri)–Midterm test in class.**
- 10-12 November (Mon-Wed)–Autumn Break, no lectures.
- 05 December (Wed)–Last class of the term.
- 09-20 December inclusive–Formal examination period.

Homework

The best way to learn mathematics is by doing it. So there will be challenging homework due every week. The average score on the the best N-1 of N weekly assignments will count for half of each student's term grade. (Probably N=12. The calculation will exclude Assignment 0.) The Canvas system will be used to distribute the assignment questions and collect the responses. Deadlines will be strictly enforced.

Essential References

- Brian S. Thomson, Judith B. Bruckner, and Andrew M. Bruckner, *Elementary Real Analysis (second edition).* Online: ClassicalRealAnalysis.com, 2008. Free PDF available.
- Walter Rudin, *Principles of Mathematical Analysis* (Third Edition). Toronto: McGraw-Hill, 1976.

Other Books

- Michael Spivak, *Calculus*. Houston: Publish or Perish Press, 1994.
- Irving Kaplansky, *Set theory and metric spaces.* Boston: Allyn and Bacon, 1972.
- George F. Simmons, *Introduction to Topology and Modern Analysis*. New York: McGraw-Hill, 1963.

Online Resources

- Andrew Rechnitzer, Notes for MATH 319. (UBC MATH 319 is a majors-level course treating many of the topic we consider in MATH 320. These notes offer a different, sometimes more approachable, perspective that students may find helpful.)
- Wikipedia. Honestly!
- Philip D. Loewen, MATH 101 Enrichment Videos. This collection of videos intended for MATH 101 students provides a glimpse of the style of reasoning that is typical in MATH 320. The archive lists the most recent one first. Start at the bottom of the list to view them in chronological order.

Grading Formula

Term scores will count for 50% of the final grade; the final exam will count for the other 50%. Term scores will be the average of the score on the midterm and the average homework grade. The final exam will last 2.5 hours, and be held at some time during UBC's formal examination period. The homework will be challenging and essential. Grades may be scaled due to the challenging nature of the course material.

Policies

- All tests, including the final examination, will be strictly closed book: no formula sheets or electronic resources will be allowed.
- Students are encouraged to discuss the material in person and on Piazza. However, each individual should ultimately hand in a document that expresses their own thoughts and their own words.
- The goal of this course is to train human thinkers. If you must use Artificial Intelligence, please make sure that your interactions are strengthening your personal problem-solving and reasoning skills. Expect this to involve confusion, struggle, even frustration, at times. Prioritize building up your own brain over getting the right answer.
- Please consult page of General Syllabus Information for notes that apply to all MATH_V courses: topics covered include Academic Integrity, Attendance, Deferred Standing, and more.