Math171: Fundamental Concepts of Analysis

Syllabus

Updated: April 2, 2026

1 Course Description

In this class, we will study the foundations of real analysis, at the level of generality up to metric spaces. This involves differential calculus, Riemann integrals, continuity and compactness in metric spaces, and basic point set topology. This class is recommended for Mathematics majors and required of honors Mathematics majors. It is a more advanced and general version of Math 115. It has the following prerequisites: Math 61CM, or 61DM, or Math 51 and Math 115. There is a writing requirement for this class: WIM guidance.

Class Times:

Days	Time	Location
Monday, Wednesday, Friday	12:30 PM – 1:20 PM	Building 380, Room 380W

Term Dates: March 30, 2026 – June 3, 2026

Final Exam: June 10, 2026, 3:30 PM – 6:30 PM

In-Person Policy: Lectures are held in person. No recordings will be provided. Students are responsible for obtaining notes from classmates if absent. All exams are in person; no remote exam arrangements will be made.

2 Instructors

Principal Instructor: Joseph Miller

Office Hours: Mondays 2:00 PM – 3:30 PM, Fridays 2:00 PM – 3:30 PM, Building 380, Room 384-V.

Email: jkm314@stanford.edu

Teaching Assistants:

- *Name*: Yizhen Chen

  Office Hours: Tuesdays 1:00 PM – 3:00 PM, Thursdays 1:00 PM – 2:00 PM, Building 380, Room 380J.

- *Name*: Zihao Wang

  Office Hours: Tuesdays 3:00 PM – 4:00 PM, Wednesdays 4:30 PM – 6:30 PM, Building 380, Room 380H.

3 Course Materials

Textbooks: The main reference for this class will be *Foundations of Mathematical Analysis* by Johnsonbaugh and Pfaffenberger. The secondary references are *Principles of Mathematical Analysis* by Rudin, and *Counterexamples in Analysis* by Gelbaum and Olmsted. We will not follow any textbook exactly, but these are all solid resources. If you use any reference on the assignments, you must cite your sources; See Section 6.

Websites: We will be using the following websites:

- Canvas: View assignments, submit homework, class announcements, and class handouts.
- Overleaf: The recommended LaTeX editor for typesetting assignments.

4 Assignments & Exams

Homework Assignments: There will be 8 homework assignments due on **Wednesdays at 9:00 AM** on Canvas. See Section 5 and Section 6 for details. It is highly recommended to use the typesetting language LaTeX to submit homework, and templates can be found on Canvas.

Midterm Exam: There will be an in-person, closed-book evening exam. **Monday, May 4, 2026, 6:30 PM – 8:00 PM**. The exam room will be announced on Canvas.

Final Exam: The final exam will be held on **Wednesday, June 10, 2026 from 3:30 PM – 6:30 PM**. The exam room will be assigned later in the quarter.

Writing Project: You will be asked to write 5–10 pages of expository mathematics on a topic in analysis. A list of topics to choose from will be given around Week 3. A first draft will be due at the end of Week 7, and the final draft due during the last week of instruction. See Section 5 for details. This is part of the Writing In Mathematics (WIM) requirement.

Grading: The grade will be based on the following formula,

$$\text{Final Score} = 0.20 \times (\text{Writing Project}) + 0.25 \times (\text{Midterm}) + 0.40 \times (\text{Final}) + 0.15 \times (\text{Homework}),$$

where the writing project score is determined by

$$\text{Writing Project} = 0.25 \times (\text{First Draft}) + 0.75 \times (\text{Final Draft}).$$

5 Course Schedule

Tentative Schedule: The schedule below is a rough guide to the topics we will cover throughout the quarter. Due to the pace of the class and the varying difficulty of the material, we may adjust the schedule as needed. Students are responsible for all material covered in lecture, regardless of deviations from the schedule. Homework assignments will align approximately with the topics listed below.

Week	Topics	Assignments
1 (Mar 30)	Sets, Functions, $\mathbb{R}$	
2 (Apr 6)	Integers, Rationals, Countability	HW 1, **Wed Apr 8 @ 9 AM**
3 (Apr 13)	Sequences, Limits, Convergence (Writing topics released)	HW 2, **Wed Apr 15 @ 9 AM**
4 (Apr 20)	lim sup/inf, Cauchy, Bolzano-Weierstrass	HW 3, **Wed Apr 22 @ 9 AM**
5 (Apr 27)	Series, Convergence Tests	HW 4, **Wed Apr 29 @ 9 AM**
6 (May 4)	Function Limits, Continuity **Midterm** (Mon May 4, 6:30–8:00 PM)	HW 5, **Wed May 6 @ 9 AM**
7 (May 11)	Metric Spaces, Open and Closed Sets	HW 6, **Wed May 13 @ 9 AM** First Draft: **Sat May 17 @ 11:59 PM**
8 (May 18)	Compactness, Connectedness	HW 7, **Wed May 20 @ 9 AM**
9 (May 25)	Differentiation, Mean Value Theorem (*No class Monday, May 25 – Memorial Day*)	HW 8, **Wed May 27 @ 9 AM**
10 (Jun 1)	Integration, Review	Final Draft: **Sat Jun 6 @ 11:59 PM**
Finals	Exam Week	**Final Exam:** **Jun 10 @ 3:30 PM – 6:30 PM**

6 Course Policies & Student Responsibilities

Please see `https://goto.stanford.edu/mathcoursepolicies` for important course policies on exam conflicts, academic accommodations, AI guidance, and taking exams. It is your responsibility to thoroughly read this information.

The Accommodations & Flexibility Form is: `http://goto.stanford.edu/math171oae`

Attendance: Not required, but highly recommended. Lectures are held in person and no recordings will be provided. If you miss a lecture, you are responsible for obtaining notes from a classmate.

Homework Policy: The due date is always Wednesday morning at 9 AM, and no late homework will be accepted under any circumstances. (This is as much a courtesy to the grader as an incentive to stay current with the course and not fall behind.) To accommodate situations such as a serious illness or anything else that may arise, your lowest problem set score will be dropped at the end of the quarter. Regrades may be requested via Gradescope within 48 hours of receiving the grade.

Plagiarism and Collaboration: Any assignment you upload must be written only by yourself. If you collaborate with your classmates or find an answer to a problem using an external source you must cite your sources. See the Stanford Honor Code for more details.

Final Exam Conflicts: It is your responsibility to make sure that you will be available at the announced final exam time and that you do not have two exams at the same time. Stanford's policy declares that you accept the final exam schedule when you continue in the classes past the Final Study List deadline.

Alternate-Time Midterm: Students with course or competition-related exam conflicts must fill out the Google Form goto.stanford.edu/math171oae to make arrangements for an alternate exam sitting on the same day. No other schedule conflicts are accommodated.

Make-up Exams: There will be no make-up exams of any type. In order to be eligible for an incomplete ("I"), you must email the Principal Instructor before the last class meeting.

7 Access & Accommodations

If you experience disability, please register with the Office of Accessible Education (OAE). Professional staff will evaluate your needs, support appropriate and reasonable accommodations, and prepare an Academic Accommodation Letter for faculty. To get started, or to re-initiate services, please visit oae.stanford.edu. The "OAE" is located at 563 Salvatierra Walk (phone: 1-650-723-1066).

To receive academic accommodations in this course, you must provide an accommodation letter from the OAE, dated in the current quarter, by filling out the Accommodations & Flexibility GoogleForm to detail the specific accommodations you will need in this course. Letters are preferred by the end of Week 2, and at least two business weeks in advance of any exam to have adequate time to arrange the accommodations.

New accommodation letters, or revised letters, can be submitted throughout the quarter; please note that there may be constraints in fulfilling last-minute requests. Alerting the course staff is not equivalent to filling out the Accommodations & Flexibility Form and may result in your not receiving accommodations.

Resilient Teaching: Stanford as an institution is committed to the highest quality education, and as your teaching team, our first priority is to uphold your educational experience. To that end we are committed to following the syllabus as written here, including through short or long-term disruptions, such as public health emergencies, natural disasters, or protests and demonstrations. However, there may be extenuating circumstances that necessitate some changes. Should adjustments be necessary we will communicate clearly and promptly to ensure you understand the expectations and are positioned for successful learning.