Math 104: Introduction to Analysis

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Course Description. The goal of this course is to give an introduction to real analysis. Topics that will be discussed include: The real numbers; sequences, limits, and continuous functions; metric spaces; uniform convergence; differentiation; Mean Value Theorem and applications; the Riemann integral.

Course Website. The website for the course is https://math.berkeley.edu/~willfisher/teaching/104sm24/index.html. Here you can find general course information and homework assignments. There is also a course bCourses where you can find assignments and lecture recordings.

Textbook. We will be using Walter Rudin's *Principles of Mathematical Analysis*. It is recommended that students supplement lectures by reading the corresponding portions of the textbook.

Additional resources include

- *Elementary Analysis: The Theory of Calculus*, Kenneth Ross
- Michael Hutching's notes on proofs https://math.berkeley.edu/~hutching/teach/proofs.pdf

These resources are readily available online—if you struggle to find any of them please reach out to me.

Course Schedule. The tentative course schedule is as follows. The exact topics and timeline are subject to change.

Week	Content	Rudin Sections
1	Fields; $\mathbb{R}$; density of $\mathbb{Q}$; cardinality	1.1 - 1.4; 2.1
2	Metric spaces; open, closed and compact sets; compact intervals; connected sets	2.2 - 2.3; 2.5
3	The Heine-Borel Theorem; sequences; convergence; Cauchy sequences; completeness	2.3; 3.1 - 3.3
Midterm 1 (Monday, July 8th)		
4	lim sup and lim inf; limits of functions; continuity; continuity and compact, connected sets	3.4; 4.1 - 4.4
5	uniform continuity; differentiation; local extrema; mean value theorem	4.3; 5.1 - 5.2
Midterm 2 (Monday, July 22nd)		
6	Riemann sums; integrals; the Fundamental Theorem of Calculus	6.1 - 6.3
7	sequences of functions; uniform convergence	7.1 - 7.3
8	The Stone-Weierstrass theorem; review	7.7
Final (Friday, August 9th)		

Homework. Homework assignments will be posted on the course webpage, and will be collected via Gradescope. There will be an assignment due on Thursday most weeks of the course, with some exceptions. **No late homework will be accepted. Your lowest homework score will be automatically dropped.**

Collaboration is strongly encouraged—you should be working with your peers to understand and solve the homework problems. However, your written proofs must clearly be your own and indicate that you understand the argument.

It is preferred that homework solutions are typed in a mathematical typesetting language such as LaTeX. However, this is not required and no extra points will be awarded for typed solutions. Handwritten submissions should be clearly legible. Out of courtesy for the graders, please accurately link each problem number to the page of your submission on which it begins.

Exams. The course will have two midterms and final examination. Midterms will last 1.5 hours and will be on **Monday, July 8th** and **Monday, July 22nd**. The final will last 2 hours and be on the final day of class, **Friday, August 9th**.

There will be no alternative exam times (except for relevant DSP accommodations), so please make sure you are available on the days of exams.

For the midterms, you may bring **one 8.5" × 11" page of prepared notes**, and for the final, you may bring **two 8.5" × 11" pages of prepared notes**. No other resources may be used.

Regrade Requests. Regrade requests should be submitted through Gradescope within **two days** of grades being released. Such requests should clearly state where an *objective* mistake has been made in grading. This includes but is not limited to: An incorrect application of the rubric, overlooking part of the solution (e.g. work on another page), or mistakenly marking correct solutions as incorrect. Subjective requests such as "I believe this to be a minor mistake" or "I feel this solution should be worth more points" will be ignored.

Valid regrade requests will result in a full re-evaluation of the problem and includes the possibility of a lower score being assigned.

Grading. There are two grading schemes as specified below. Whichever gives you the highest overall grade will automatically be applied.

	Homework	*Midterm 1*	*Midterm 2*	*Final*
Scheme 1	40%	15%	15%	30%
Scheme 2	40%	0%	30%	30%

Said differently, midterms constitute 30% of your grade and **Midterm 1 will be dropped if your Midterm 2 score is higher.**

Your final grade will ultimately be decided by your ability to demonstrate a solid command of the material. Broadly speaking, the following is expected for each letter grade:

- A-/A/A+: A clear demonstration that the central concepts have been fully understood; A clear ability to motivate the abstract mathematical concepts and to apply them to solve concrete problems

- B-/B/B+: Demonstration that the central concepts have been reasonably understood, perhaps with minor mistakes; Fair comprehension of the abstract mathematical concepts and ability to apply it to a decent range of concrete problems
- C-/C/C+: Vague grasp of the central concepts, perhaps with major mistakes; Understands some motivation for the abstract theory and can apply it to solve routine problems

A final curve will be applied at the end of the course. Once the final grade cut-offs have been decided, **there will be no rounding of grade percentages.**

Attendance. Attendance is not mandatory. However, in order to succeed in the course, it is strongly encouraged to attend all lectures. Recordings of the live lectures will be posted to the course bCourse page.

Academic Honesty. All students are expected to abide by the Berkeley Honour Code: "As a member of the UC Berkeley community, I act with honesty, integrity, and respect for others."

Any copying from other students on homework or exams, or consulting resources not explicitly allowed on exams, is considered cheating and will result in failure of the course and an academic misconduct report filed.

Additional Course Support Resources. The Student Learning Center (SLC) offers free drop-in tutoring and Topic Reviews for Math 104, 110, 113, 128A and 185. Tutoring services are offered Monday-Friday from 12-4pm. See more here. The weekly schedule for drop-in tutoring and Topic Reviews will be posted on the Upper Division Math SLC Page.

Special Accommodations. If you need disability-related accommodations in this class, if you have emergency medical information you wish to share with me, or if you need special arrangements in case the building must be evacuated, please inform me as soon as possible.