Final exam: May 10th (Fri) 9am~12pm in Science Center Hall E (basement)

Office hours during reading week & finals:

Date/time	Location	Held by
4/26 (F) 2pm~4pm 5/08 (W) 4:30pm~6:30pm	SC 232 SC 411	Chris
4/29 (M) 8-10 pm 5/06 (M) 8-10 pm	Lowell JCR Zoom	Marcello
5/06 (M) 2:30-3:30pm 5/07 (T) 2-3pm	SC 232 SC 530	Eunice
5/01 (W) 8-10pm 5/08 (W) 2-4pm	Quincy Dhall Math Lounge	Alex
4/28 (S) 2:30-4:30pm 5/05 (S) 2:30-4:30pm	Math Lounge	Ben
4/30 (T) 6-8pm 5/07 (T) 12-2pm	Math Lounge	Miller
4/30 (T) 7pm-9pm 5/09 (Th) 7pm-9pm	Math Lounge	Knut

Instructor: Christopher Eur (ceur@math.harvard.edu)

Time/Day: 12pm~1:15pm MWF

Location: Sever 206

Teaching Fellow: Eunice Sukarto (esukarto@math.harvard.edu)

Course Assistants:
Alex Karbowski (akarbowski@college.harvard.edu)
Marcello Laurel (marcellolaurel@college.harvard.edu)
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Knut Vanderbush (kvanderbush@college.harvard.edu)
Benjamin Walter (bwalter@college.harvard.edu)

Office hours:

Time	Location	Held by
Friday 2~4pm	SC 232	Chris
Sunday 6-8pm	Lowell JCR	Marcello
Monday 2:30~3:30pm	SC 232	Eunice
Monday 8~10pm	Lev dhall (Math night)	Alex, Ben
Tuesday 2~3pm	SC 530	Eunice
Tuesday 6~8pm	Math Lounge	Miller
Tuesday 7~9pm	Math Lounge	Knut

Course description: Math 25b is an introduction to real analysis whose topics include: topology of Euclidean spaces, convergence, continuity, differentiation, and integration. It is intended for those with strong interest in a rigorous treatment of calculus and multivariable calculus.

Prerequisite: A strong background in mathematics up to calculus, and familiarity with writing proofs. Some familiarity with linear algebra (at the level or 22a or above). A prior exposure to multivariable calculus may be helpful but not required. Those enrolled should plan to spend anywhere between 5 to 20 hours per week outside of class for Math 25b.

Textbook:
Main text: Rudin's *Principles of Mathematical Analysis (3rd Ed),* available for download here.

Supplementary: Spivak's *Calculus on Manifolds*, available for download here.
Also helpful: Paul's Online Calculus Notes.

Grades:
50% problem sets, **due 12pm every Wednesday** through Canvas. The lowest problem set score will be dropped.
20% midterm exam, to be held in-class ***(March 6th)***.
30% final exam.
If it favors the student, the final exam will account for 40% of the grade, with problem sets and the midterm reduced to 45% and 15%, respectively.

In-class presence: Regular attendance is expected for all enrolled students.

Academic integrity: For problem sets, students are encouraged to discuss with peers and the course staff, but the process of writing the solution must be done privately. All collaborators must be acknowledged. Consulting the web or AI tools like ChatGPT is allowed only for general resources; in particular, searching them for solutions to problem sets is prohibited.

Disabilities Requiring Accommodation: Those who need accommodation for documented disability should contact Chris as soon as possible. Please see https://aeo.fas.harvard.edu for more information.

Course outline:

1/22/2024	Overview, orders, real numbers	Rudin pg. 1~9
1/24/2024	basic properties of reals, countable infinity	Rudin pg. 9~11, 24~29
1/26/2024	uncountable set, open/closed sets I	Rudin pg. 29~32
1/29/2024	open/closed sets II	Rudin pg. 32~36
1/31/2024	continuity, compact sets I	Rudin pg. 36, 85~87
2/2/2024	compact sets II	Rudin pg. 37~39
2/5/2024	compact sets III, uniform continuity	Rudin pg. 40, 89~93
2/7/2024	connected sets	Rudin pg. 42~43, 93
2/9/2024	convergent sequences	Rudin pg. 47~51, 83~85
2/12/2024	subsequences, Cauchy sequences	Rudin pg. 51~55
2/14/2024	series I	Rudin pg. 57~62
2/16/2024	series II	Rudin pg. 55~57, 65~69
2/21/2024	series III, differentiation I	Rudin pg. 70~77, 103~106
2/23/2024	differentiation II	Rudin pg. 107~109
2/26/2024	differentiation III, integration I	Rudin pg. 109~113, 120~123
2/28/2024	integration II	Rudin pg. 124~127
3/1/2024	integration III	Rudin pg. 127~132
3/4/2024	Fundamental theorem of calculus	Rudin pg. 130, 132~134
3/6/2024	Midterm Exam	
3/8/2024	Midterm reflections	
3/18/2024	Uniform convergence I	Rudin pg. 143~151
3/20/2024	Uniform convergence II	Rudin pg. 151~154
3/22/2024	Arzela--Ascoli	Rudin pg. 155~158
3/25/2024	Stone--Weierstrass	Rudin pg. 159~164
3/27/2024	Fourier series, pathologies	Rudin pg. 185~191, 154
3/29/2024	Multivariate differentiation I	Rudin pg. 211~214
4/1/2024	Multivariate differentiation II	Rudin pg. 215~218
4/3/2024	Multivariate differentiation III	Rudin pg. 215~218

4/5/2024	Multivariate differentiation IV	Rudin pg. 219, 235~236
4/8/2024	Inverse function thm, implicit function thm	Rudin pg. 220~228, 236~238
4/10/2024	Multiple integrals, change of variables	Rudin pg. 245~248, 252
4/12/2024	Line integrals, (co)tangent spaces	
4/15/2024	Surface integrals, alternating forms	Spivak pg. 75~86 (optional)
4/17/2024	Differential forms I	Spivak pg. 86~92
4/19/2024	Differential forms II, k-cubes	Spivak pg. 86~92
4/22/2024	Stokes' theorem I	Spivak pg. 97~104
4/24/2024	Stokes' theorem II, closed/exact forms	Spivak pg. 92~95