

Mathematics 202A — Fall 2016 — Introduction to Topology and Analysis

(Preliminary draft, pending appointment of teaching assistant, confirmation of office hours, et cetera.)

Course control number: 18984

Instructor: Michael Christ. 809 Evans Hall, mchrist@berkeley.edu, 642-2143. Office hours Tuesday 10-11, Friday 2-3.

Course reader/assistant: TBA, Office hours TBA.

Course meets: MWF 1:10-2:00 in 9 Lewis Hall. *Variances:* There will be no class on Friday October 21. Class will meet on Monday December 5 (the first day of reading week).

Text: *Real Analysis* (2nd edition) by G. B. Folland, ISBN: 9780471317166.

Prerequisites: Math 104 and 113 or equivalents. Math 110 and 185, or equivalents, are strongly recommended.

Exams: Final Wednesday December 14, 7-10 PM, location TBA. Midterm Friday October 7, 1:10-2 PM, 9 Lewis Hall.

Recommended texts for supplementary/alternative reading:

Set theory: *Naive Set Theory* by P. R. Halmos.

Point set topology: *Topology* by J. Munkres.

Undergraduate real analysis: *Principles of Mathematical Analysis* by W. Rudin; *Real Mathematical Analysis* by C. Pugh.

Graduate level real analysis: *Real Analysis* by H. Royden; *Real and Complex Analysis* by W. Rudin; *Real Analysis* by E. M. Stein and R. Shakarchi.

Topics: The course will be based primarily on chapters 0 through 4 of the text. Measures (σ -algebras, outer measures, Borel measures). Lebesgue integration. Integrals and limits (Monotone and Dominated Convergence theorems; Fatou's lemma). Signed measures, and differentiation of measures (Radon-Nikodym theorem, Lebesgue's differentiation theorem). Functions of bounded variation. Point set topology (metric spaces, topological spaces, compactness, separation properties, local compactness, Weierstrass and Stone-Weierstrass theorems, Tychonoff product theorem).

As time permits: Baire's theorem. Product measures. L^p spaces (completeness and the Hölder and Minkowski inequalities, duality).

Required work: Readings, weekly problem sets, one midterm exam, final exam.

Grading: Midterm exam 15%, problem sets 40%, final exam 45%. The grading scale will be based on the graduate level system.

Math 202A is a graduate course. Not all details will be presented in class. Comprehensiveness may sometimes be sacrificed for the sake of clarity. Students are expected to study the text, and are responsible for the content of assigned readings.

- Weekly problem sets will ordinarily be due on Wednesdays in class, and will be posted approximately one week before due. Only selected problems will be graded each week. Written solutions will be provided for many problems.
- The course teaching assistant's office hours are a resource for advice concerning problem sets.
- *Bcourses site:* Problem sets, solutions, and any course lecture notes will be posted on an associated Bcourses site. Occasional announcements pertaining to the course will be distributed by email. Registered UCB students will automatically be given access to this site. Other students should please contact the instructor by email to obtain access.

- Work on exams must be entirely your own. On problem sets, collaboration is encouraged, but as always, credit must be given in writing to anyone who has contributed. (e.g. “I worked with George” or “I worked with Emily on problems 3 and 6”. Such acknowledgements do not affect your scores in any way.) Write up your work yourself, even if you have collaborated.

Solutions to many problems can be found on the internet and elsewhere. Consultation of such solutions before serious independent effort is strongly discouraged. (One learns by wrestling with problems. One appreciates the key points of a solution better after becoming familiar with the difficulties that it overcomes.) Academic honesty entails acknowledgement of any such consultation.