Carnegie Mellon University

Department of Mathematical Sciences

21-355 Section A: Principles of Real Analysis I

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Office Hours:

Session: Fall 2016
WWW: `www.math.cmu.edu/~jballew/21355Fall2016.html`
Office Phone: N/A
M 10:00 AM–11:00 AM, WR 3:00 PM–4:00 PM

Lecture Times: MWF 11:30 AM–12:20 PM

Room: WEH 5302

Textbook

Abbott, Stephen. *Understanding Analysis.* Springer, New York, second edition, 2015. Print ISBN: 978-1-4939-2711-1, Online ISBN: 978-1-4939-2712-8.

Course Description

This course provides a rigorous and proof-based treatment of functions of one real variable. Topics include the real number system: field and order axioms, suprema and infima, completeness, integers and rational numbers; real sequences: limits, cluster points, limsup and liminf, subsequences, monotonic sequences, Cauchy's criterion, Bolzano-Weierstrass Theorem; topology of the real line: open sets, closed sets, density, compactness, Heine-Borel Theorem; continuity: attainment of extrema, Intermediate Value Theorem, uniform continuity; differentiation: chain rule, local extrema, mean-value theorems, L'Hospital's rule, Taylor's theorem; Riemann integration: partitions, upper and lower integrals, sufficient conditions for integrability, Fundamental Theorem of Calculus; and sequences of functions: pointwise convergence, uniform convergence, interchanging the order of limits. The course presumes some mathematical sophistication including the ability to recognize, read, and write proofs.

Evaluation

Evaluation will be based upon two midterm exams, a final exam, homework assignments, and class participation (including presentations and involvement in class discussions). The breakdown is as follows.

- Each Midterm: 20%
- Final Exam: 25%
- Homework: 20%
- Participation: 15%

Any curving of grades will be based upon the final course grade; individual assignments and exams will not be curved.

Assignment Details

Homework will be assigned roughly biweekly, and each assignment will be worth one hundred points (except the first assignment, which will be worth fifty points). Problems for the assignments will be book problems and my own problems. The coversheet for each assignment will be posted as a PDF file on the course website and on Blackboard. Homework will be due at the BEGINNING OF CLASS on the due date, typically on Fridays. You must staple the coversheet to the top of your homework assignment or five points will be deducted. Late homework assignments will be accepted without a grade penalty only with a legitimate reason (illness, death in the family, religious observance, university-sponsored activity, etc.). Documentation may be required if there is an excessive number of late assignments. Students may collaborate on homework assignments, but each student must submit his or her *own* work. It is highly suggested that students use LaTeX to type-set their assignments, but this will not be required.

Both midterm exams will be take-home exams. Students will have one week to work on each exam. Each midterm will be due at the beginning of class on the due date. Late midterm exams will be accepted for a grade only with a legitimate excuse (illness, death in the family, university-sponsored activity, etc.). Students will be allowed to use the textbook and their class notes on each of the midterms; however, they are not to collaborate with each other or use any other books or resources (Internet, other professors, students from other classes, etc.).

The final exam will occur at the scheduled time to be announced later in the semester. Class notes and the textbook will be allowed for the final exam.

Participation and Presentations

Analysis is learned by doing, not just by listening to lectures. As such, class participation will be a key component of the course, thus attendance in class is also important. Throughout the semester, students will present proofs in class. The other students will be expected to discuss the proof that is presented in a constructive manner. Both presentations and comments will contribute to the participation and presentation score.

Miscellaneous

Students are expected to abide by policies of academic integrity available at the web address `http://www.cmu.edu/academic-integrity/`. Only authorized aids will be allowed on exams.

Students are also encouraged to get help from other classmates or from me when necessary. You are welcome at any time during office hours or you may make an appointment. Please place "21-355" in the subject line of any emails to me and allow 24 hours for a response.