Introduction to Real Analysis (Math 517)

Fall 2017

Technicalities

Instructor: Dr. Clayton Shonkwiler (`clay@shonkwiler.org`)
Office: Weber 216
Course web page: `http://shonkwiler.org/517`
Text: *Principles of Mathematical Analysis*, by Walter Rudin
Time/Location: 12:00–12:50 MTWF, Engineering E106.
Office Hours: Monday 3:00–4:00, Wednesday 11:00–12:00 and 3:00–4:00, Thursday 2:00–3:00, and by appointment.

Summary of the Course

The goal of this course is to develop the theory of limits, continuity, differentiation, and linearization in a relatively general setting. These are the same concepts that are taught in a typical undergraduate analysis course (like MATH 317), so you should already have some familiarity with them. However, in this course we want to get a little more serious and develop this theory in general metric spaces (to the extent possible) and in higher-dimensional Euclidean spaces.

Here are the topics for the course as listed in the Qualifying Exam syllabus:

- Metric spaces, compactness, completeness.
- Sequences, convergence, Cauchy sequences.
- Series, power series, nonnegative and absolutely convergent series.
- Continuity, uniform continuity, intermediate value theorem.
- Sequences and series of functions, pointwise and uniform convergence.
- Weierstrass approximation theorem, equicontinuity, the Arzela-Ascoli theorem.
- Differentiation in several variables, partial derivatives, the chain rule.
- Linearization, mean value theorems, sequences of differentiable functions.
- Higher order derivatives, power series, Taylors theorem.
- Contraction mapping principle, implicit and inverse function theorems.

Homework

Homework will be collected on an approximately weekly basis. Assignments will be posted to the course webpage.

Homework must be stapled with your name clearly written at the top. What you turn in should be a final copy: it should be neat, legible, and well-organized. If I can't read or understand your work you won't receive any credit.

Late homework will not be accepted, so you should turn in whatever you have completed on the due date in order to get credit for it.

I strongly encourage you to work on solving homework problems with your fellow classmates. However, the work you turn in must reflect your own knowledge and understanding and not that of anyone else. Therefore, you *must* write up your solutions by yourself.

Exams

There will be one midterm exam and a final. The midterm will be a 50 minute in-class exam tentatively scheduled for **October 11**. The final exam (which also serves as the MATH 517 qualifying exam) will occur in Engineering E106 (our regular classroom) from **4:10–6:10 on Wednesday, December 13**.

Make-up examinations will only be given under extraordinary circumstances, which must be appropriately documented (by, e.g., a medical or legal professional).

Grading

Your final grade in the course will be determined by:

Homework and Class Participation: 50%
Exams: 50%

Attendance

You are expected to attend class every day, to participate in class, to read the textbook, and to do the homework.

Academic Integrity

As a Colorado State University student, you have agreed to abide by the University Policy on Academic Integrity (see University Policies → Students' Responsibilities → Academic Integrity/Misconduct in the General Catalog `http://catalog.colostate.edu/general-catalog/`) and by the Student Conduct Code. Please see `http://tilt.colostate.edu/integrity/` for more on academic integrity at CSU. All academic work must meet the standards described in the Academic Integrity Policy. At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

Lack of knowledge of the academic honesty policy is *not* a viable explanation for a violation. Questions related to coursework and the academic integrity policy should be discussed with the instructor.

You are encouraged to *discuss* homework problems with your classmates, but the work you turn in must be your own, and in particular you should write up your final solutions independently. Remember that for all work in this course, the CSU honor pledge applies: "I have not given, received, or used any unauthorized assistance."

Accommodations

If you think you may need accommodations in this course due to the impact of a disability please meet with me privately during the first week of class. You should also contact the Resources for Disabled Students office (`http://rds.colostate.edu`) to confirm your eligibility for appropriate accommodations. Doing so early in the semester will help prevent unnecessary inconvenience.

Copyright

Disclaimer

The course syllabus is a general plan for the course; deviations announced in class may be necessary.

Anticipated Schedule

Topic	**Weeks**
Number Systems, Euclidean Spaces	1
Basic Topology	1
Numerical Sequences and Series	2
Continuity	1
Differentiation	2
Functional Limits	1
Power Series, Fourier Series	1
Functions of Several Variables	4
Preview of Integration	1