College of the Holy Cross, Fall Semester, 2021
Math 361, Section 01 (Professor Hwang)
Course Information Sheet

Contact Information

Office Hours: M 11-11:50, W 10:00-10:50, or by appointment
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web: `http://mathcs.holycross.edu/~ahwang/teach/361/index.html`

Introduction

Real Analysis extends the ideas started in calculus and continued in the analysis portion of *Mathematical Structures*. The primary technical concept is a *limit*. Unlike calculus, where we treat limits pictorially and informally, in analysis we'll put limits on a solid logical foundation. One of the most intuitive ways to define limits is using an adversarial challenge-response game. We'll learn how to play this game with successively more elaborate rules that capture the properties we want to study.

The first two-thirds of the course is devoted to developing one-variable calculus with careful attention to logic. This will also give us the chance to review continuity, the intermediate and extreme value theorems, derivatives and the mean value theorem, integrals and the fundemantal theorems of calculus, and to give rigorous definitions of logarithms, exponentials, and the circular functions. In the last third, we'll apply analytic techniques to spaces whose "points" are *functions*.

The most important habit you can develop is to **keep up with the course**: Read the textbook actively ahead of class, and ask questions in class and office hours. Do not wait a few days to see me if you feel you're starting to fall behind.

Grading

My goals for you in the course are that you enjoyably extend your knowledge of calculus, and explain your work clearly in writing. The course grade has three components: a proof portfolio, three in-class tests, and the final exam.

Proof Portfolio Each Friday I'll assign computations and proof questions for write-up. These should be turned in for commenting by the following Friday. These problem sets are not numerically scored, but instead allow you to work with the material and receive feedback. Some questions will be marked with a topic category. As the semester progresses, you'll submit final drafts of ten questions of your choosing, one from each topic category. These write-ups will count for 50% of your course grade. Please see the proof portfolio page
`http://mathcs.holycross.edu/~ahwang/teach/361/prob.html`
for information, expectations, and grading.

Midterm Tests There are three midterm tests, to be held during class time on Friday, September 24, Friday, October 22, and Monday, November 22. The lowest two scores count for 10% of the course grade and the highest counts for 15%.

Final Exam The cumulative final exam is worth 15% of the course grade. The final exam will be given during the exam period in December, at the time to be announced by the College.

Meeting Schedule

Deviations from this schedule will be announced by email.

W	Sep 1	Section 1	Real Numbers
F	Sep 3	Section 2.1-2.2	Intervals and Bounds
M	Sep 6	Section 2.3	The Archimedean Property
W	Sep 8	Section 2.4	Topology
F	Sep 10	Section 3.1	Convergence
M	Sep 13	Section 3.2-3.3	Properties of Limits
W	Sep 15	Section 3.5	Subsequences, Cauchy Sequences
F	Sep 17	Section 3.6	Infinite Series
M	Sep 20	Section 3.7	Absolute Summability
W	Sep 22	Section 4.1-4.2	Functions, Composition, Inversion
F	Sep 24		**Midterm 1**
M	Sep 27	Section 4.3	Cardinality
W	Sep 29	Section 4.4	Power Series
F	Oct 1	Section 5.1	Continuity
M	Oct 4	Section 5.2	Limits
W	Oct 6	Section 5.3	Landau Notation, Power Series
F	Oct 8	Section 5.4	The Intermediate Value Theorem
M	Oct 18	Section 5.5	The Extreme Value Theorem
W	Oct 20	Section 6.1-6.2	Properties of the Integral
F	Oct 22		**Midterm 2**
M	Oct 25	Section 6.3	Integrability
W	Oct 27	Section 6.4	Definite Integrals
F	Oct 29	Section 7.1-7.2	Differentiability
M	Nov 1	Section 7.3	The Mean Value Theorem
W	Nov 3	Section 8.1	The Fundamental Theorems
F	Nov 5	Section 8.2	Taylor's Theorem
M	Nov 8	Section 9.1	Exp
W	Nov 10	Section 9.2	Representations of Exp
F	Nov 12	Section 10.1	Sine and Cosine
M	Nov 15	Section 10.2	Periodicity
W	Nov 17	Section 11.1	Normed Vector Spaces
F	Nov 19	Section 11.2	Metric Spaces
M	Nov 22		**Midterm 3**
M	Nov 29	Section 11.3	Open and Closed Sets
W	Dec 1	Section 11.5-11.6	Boundedness and Compactness
F	Dec 3	Section 11.6	Compactness
M	Dec 6	Section 12.1	Sequences in Metric Spaces
W	Dec 8	Section 12.2	Continuity of Mappings
F	Dec 10	Section 12.4	Uniform Limits