

MATH 242 – Principles of Analysis  
MWF 9-9:50, Swords 328

Syllabus

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Office Hours: MW 11 AM–Noon, TR 1-1:50 PM , F 2-3 PM and by appointment.  
Course Home Page: <http://math.holycross.edu/~dbd/math242/math242.html>

**Course Materials** (available in the College Bookstore): (1) *An Introduction to Analysis*, Gerald G. Bilodeau and Paul R. Thie.

**Prerequisites:** MATH 132, an equivalent college calculus course, or a 4 or 5 on the BC Advanced Placement Exam in Mathematics, and MATH 241 or a course in multivariable calculus.

**Intended Audience:** This course is designed for students who are interested in further mathematical study, including students who are considering a major in mathematics. It is a required course for mathematics majors and is a prerequisite for most upper division mathematics courses.

**Introduction to Analysis:** Principles of Analysis is a one semester course in the theory of one-variable calculus. Thus the topics, limits, continuity, differentiability, etc., will be familiar. The difference between this course and the one-variable calculus course(s) that you have taken, is that instead of spending time developing algorithms for carrying out calculations, we will spend time with the definitions of concepts and proving properties of functions directly from the definitions. Rather than being a detour from the type of mathematics that you've seen to date, this is what mathematics is all about. Indeed, this course is intended to provide a bridge between algorithm-based courses that you have seen so far and the more theoretical upper division mathematics courses and the goal is to develop your theorem proving skills.

As it's presented now in textbooks, analysis, or the theory of calculus, is a coherent whole that progresses from basic definitions about sets through the real number system and its properties, sequences, limits, and then to continuity, differentiability and integrability of functions. We might imagine that this order reflects the historical development of the subject. We still quote and use ideas of Pythagoras, Euclid, and Archimedes from BCE. The calculus concepts that we learn today would be recognizable to Newton and Leibniz, who lived in the 17th and early 18th century; the symbols that we use would be recognizable to Euler, who died in 1783; and the theory of the Riemann integral was of course known to Riemann, who died in 1866. Yet the development of analysis was far from linear. Concepts were developed and used often well before they could be proved with rigor. For example, and it is a large one, the real number system was not defined rigorously until the 1880's by several mathematicians, including Dedekind and Cantor, and the rational numbers were only given a firm foundation by Peano a short time later. Thus, we should understand that the clean, compact and rigorous mathematics that we'll be learning resulted from a long multi-branched development and that the branches grew at very different rates.

**From the text:** We will cover Chapters 1 - 6 of the text, spending roughly two weeks on each chapter.

**Class Format:** Most classes will be lectures. There will be one in-class small-group discussion for each chapter. There will also be evening review sessions before each exam.

**Calculators/Computers:** We will occasionally use graphing calculators to test hypotheses or Maple to demonstrate concepts in class. The emphasis, however, is on theory, so the problem solving will be of a more theoretical nature and technology will be of only marginal help.

**Homework:** There will be weekly homework assignments consisting 8-10 problems from the text or handouts. Homework will due on Monday. I will grade roughly half these problems for credit and will provide solutions for all the homework problems. The problems to be graded will be chosen randomly from the assignment.

**Exams:** There will be two in-class hour exams. The first will be on Monday, February 24, and will cover Chapters 1 and 2 of the text. The second will be Monday, March 31, and will cover Chapters 3 and 4 of the text. The final exam will be a 3-hour scheduled final exam on Saturday, May 3, at 8:30 AM. It will be a comprehensive exam.

**Grading:** There are several components to the course grade.

Homework	20%
Collaborative Assignments	10%
Hour Exams (2)	20% each
Final Exam (12/21)	30%
Total	<hr/> 100%

**Academic Honesty:** The Department of Mathematics and Computer Science adheres to the College's policy on Academic Honesty, which may be found on page 13 of the 2002-2003 College Catalogue. In addition, the department has formulated the attached statement intended to amplify the policy as to how it might apply in mathematics and computer science.