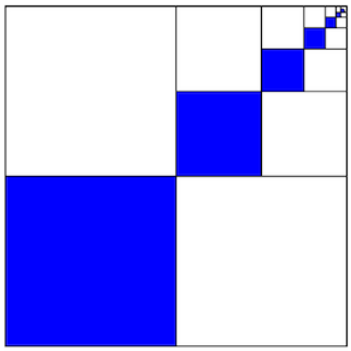
Calculus II



$$\frac{1}{3} = \frac{1}{4} + \frac{1}{16} + \frac{1}{64} + \cdots = \sum_{i=1}^{\infty} \frac{1}{4^i}$$

Math 116 *(Calculus II)* begins where a typical introduction to calculus finishes: at the definition of the integral and its connections to so-called anti-derivatives. After refamiliarizing ourselves with these basic terms, we'll spend the first half of the semester covering integrals in depth: first by developing techniques for evaluating difficult integrals, and then by discussing a variety of applications of the integral.

In the second half of the course we change gears, introducing the related notions of sequences and series. These will let us tackle the problem of infinite sums, and we'll develop a number of tools for calculating when an infinite sum makes sense. Though these ideas begin by considering infinite sums of numbers, the payoff of our analysis is to carry these questions over to infinite sums of *functions*. This will allow us to express crazy functions as (infinite) sums of certain nice functions like polynomials or sines and cosines; you might know this kind of decomposition as Taylor and Fourier series.

1. Course topics

Integration techniques (Riemann sums, the Fundamental Theorems of Calculus, u-substitution, integration by parts, trigonometric substitutions, partial fractions), improper integrals, comparison tests for integrals, volumes via integration, arc length, numeric integration, sequences (evaluating limits of sequences), series (geometric series, divergence test, integral test, comparison tests, error approximation, alternating series, ratio test, root test), power series, Taylor series

2. Course Details

2.1. **Professor.** The professor for this class is Andy Schultz. His office is on the third floor of the Science Center, room S352. He will be available to discuss topics from this course 30 minutes before the start of each class period, and often in the 30 minutes after the end of each class period.

You can contact the instructor at andrew.c.schultz@gmail.com. Though he is always happy to receive emails from you with questions or concerns about the course, he can't guarantee that he'll be able to promptly reply to emails late at night or over the weekend. If you do contact the professor by email, please be sure to follow standard email etiquette. In particular, please make sure you include a greeting and signature and avoid abbreviations. If you're contacting him to ask about a problem, please be sure to specify what the problem asks (as opposed to asking something like "I can't get problem 2 and need your help").

2.2. **Text.** The course is centered around Stewart's Calculus: Concepts & Contexts, 4th edition. You can purchase the single-variable version of this text at the bookstore or online. The ISBN for the text is 978-0-495-55972-6. The text can be used as a supplemental reference for the material we cover or as a bank of practice problems; for this reason you do not have to purchase the suggested edition of the text. If you do chose to use a different version of the text, it will be your responsibility to track down any differences between the posted optional problems and the problems that appear in your edition of the text.

2.3. **Online resources.** You'll be able to access homework assignments, lecture summaries and copies of quizzes online through the course webpage at `http://palmer.wellesley.edu/~aschultz/summer16/math116`.

3. Expectations

3.1. **Prerequisites.** Students are expected to have a solid understanding of standard, high school-level algebra and trigonometry. Students are also expected to be proficient in the topics covered in a first calculus course. If you find that you are struggling with any of the prerequisite topics, contact the instructor immediately so he can help you get caught up to speed.

3.2. **In-class expectations.** A student's engaged presence is expected in classroom lectures. While the professor is in charge of determining what content is covered during a class period, students share the responsibility of directing lectures and discussion sections so each is as clear as possible. In particular, students should feel comfortable stopping the instructor to ask him to repeat a particular exposition, to present a concrete example of an abstract concept, or to explain a confusing concept in a new way. Classroom time is there for the benefit of students, so should be treated as an interactive resource.

3.3. **Attendance.** Mathematics requires that a student understand one concept before moving on to the next, and since our course moves at a fast pace it is critical that you attend each and every class.

3.4. **Effort.** Many students have the impression that "understanding the material" means instantly knowing how to do problems assigned in the class. On the contrary, most students find they don't truly understand the course material until they have struggled through several attempts at solving problems or understanding concepts. You are expected to exert a good amount of effort in working through the course material, and you shouldn't be discouraged if a certain topic remains elusive when you first encounter it: try some suggested problems, go to office hours, and ask your instructor or friends for help when you need it. Because this is a summer course that runs at an accelerated pace, this means that you should be spending LOTS of time outside of class trying to work through problems, and not just the problems that are assigned for a homework grade.

3.5. **Academic Integrity.** Students are expected to read and understand the college's Honor Code. Incidents where academic integrity have been compromised will be dealt with severely. Although most students have a good feel for what constitutes a violation of the Honor Code, for this class you will also need to be familiar with the instructor's policy on homework collaboration. Please be sure to thoroughly read and understand the section on homework below to avoid an inadvertent violation of the Honor Code.

4. Grading

Your performance in this class is graded based on your ability to perform two tasks. First, you are expected to develop an understanding of concepts covered in the course and an ability to do related computations. Second, you are expected to be able to clearly display your understanding to your instructor and your peers. Though these goals are certainly interrelated, a mastery of one skill does not imply a mastery of the other. For instance, it's possible that you have a good understanding of the course material but can't exhibit this to someone else.

4.1. **Homework.** Homework problems will be completed through the MAA's WebWork online homework system; a link to our courses WebWork site can be found on the course webpage. Homework will be due before each exam and before the final exam. Your homework grade is calculated by averaging your homework scores. Homework accounts for a significant portion of your grade, so it's critically important that you complete all homework assignments and submit them on time. Homework is also critical in developing your understanding of the course material. For this reason, it's important that you make homework an exercise that promotes understanding.

An important note about collaboration and the Honor Code. Students are more than welcome to work with the instructor or their friends when solving homework problems. In the event that you have taken notes while working with someone else, you must put these notes away and recreate the solutions on your own when you submit your solutions for the homework assignment. Using notes from a collaboration while writing your homework assignment will be considered a violation of the Honor Code. If you have any confusion about this policy, please talk to the instructor.

4.2. **Tests.** There will be 2 midterm examinations and 1 final. Both midterms are given during the regularly scheduled lecture period in the regularly scheduled classroom, so there should be no conflicts which prevent you from taking either midterm as scheduled. The first exam will be held on Friday, June 10, and the second will be held on Friday, June 17; you will have 70 minutes to complete each of these tests. Your final will be Friday, June 24, and you will have 150 minutes for this exam.

4.3. **Computing your grade.** Your grade is computed as follows:

- `Midterm 1 ..... 25%`
- `Midterm 2 ..... 25%`
- `Homework Average ..... 20%`
- `Final ..... 30%`