

CALCULUS I

MATH UN1101, Sec. 008, TTh 2:40pm – 3:55pm, Online (Zoom)

Instructor: Robin Zhang

Email: rzhang@math.columbia.edu

Office Hours: 4:00–5:00pm on Tuesdays, 2:00–3:00pm on Wednesdays.

Course Website: http://math.columbia.edu/~rzhang/teaching/calc_f20.html

Textbook: Stewart, James (2015). *Calculus: Early Transcendentals* (8th ed.). Cengage Learning. ISBN 9781305480513.

Prerequisites: College Algebra / Analytic Geometry (UN1003) or similar.

1. COURSE DESCRIPTION

Welcome to Calculus I! In this course, we will study the foundations of single-variable calculus, which consists of two main components: **differential calculus** and **integral calculus**.

- In **differential calculus**, we try to understand how functions change – a powerful tool for solving practical problems such as maximizing profit or minimizing costs in the real world.
- In **integral calculus**, we study the accumulation of functions which allow us to compute values such as areas and volumes.

These two branches of calculus are deeply related through what is called the Fundamental Theorem of Calculus.

Throughout the semester, we will introduce the basics of both differential calculus and integral calculus. The aim is to gain fluency in working with infinitesimals and solving practical problems with calculus techniques. Finally, we will culminate in understanding how differential calculus and integral calculus are connected through the Fundamental Theorem of Calculus.

2. PREREQUISITES

The only prerequisite for this class is what is called “Precalculus” in much of the United States, i.e. an understanding of polynomials, graphs, functions, conic sections, and trigonometry. This corresponds to the course *College Algebra / Analytic Geometry* (UN1003) at Columbia.

To be able to learn and use calculus, you must be fluent with precalculus. In particular, you should be very comfortable with solving, simplifying, and graphing (by hand): algebraic, exponential, logarithmic, trigonometric, and inverse functions. We will quickly review these concepts during the first two weeks.

3. COURSE OUTLINE

The course will cover the first five chapters of the course textbook *Calculus: Early Transcendentals* (8th ed.). If we have time, we will cover a few sections from the sixth chapter. Throughout the course, I will supplement the textbook with real-world examples.

- Chapter 1: Functions and Models
- Chapter 2: Limits and Derivatives
- Chapter 3: Differentiation Rules
- Chapter 4: Applications of Differentiation
- Chapter 5: Integrals
- Chapter 6: Applications of Integration

See the course website for an up-to-date outline of the topics covered in the course.

4. LOGISTICS

The course will meet on Tuesdays and Thursdays from 2:40 – 3:55 PM (ET – local New York time). The lectures will be regularly held on Zoom. The Zoom meeting link will be posted on Courseworks (<https://courseworks2.columbia.edu/>), where you will also find other important class announcements. To contact me, please email me using your UNI@columbia.edu address.

To register for the course WebAssign (<https://www.webassign.net>), use the class key: columbia 1876 3170. See Columbia’s WebAssign Student FAQ for details on accessing WebAssign.

The course textbook will be used throughout the semester so it will be useful to have access to it. It is **not strictly required** for students to have a copy of the textbook for homework or exams. If you are a diligent note-taker and complete all of the homework exercises, you can succeed in this course without the course textbook.

The most up-to-date information on the course will generally be on the course website: http://math.columbia.edu/~rzhang/teaching/calc_f20.html.

5. HELP ROOM

If you need additional assistance with course material during the semester, the Mathematics Department organizes a complimentary help room with teaching assistants. The schedule of the virtual help room (accessible via Zoom) for this course is available at: <https://www.math.columbia.edu/fall20-helproom1/>.

6. GRADING POLICY

Your final grade will be according to the following formula:

- **Final:** 30%
- **Midterm I:** 20%
- **Midterm II:** 20%
- **WebAssign Homework:** 20%
- **Comprehension checks:** 10%

There will be no extra credit. Grades will be “curved” if the distribution of grades is unusual. Anyone found to have cheated on an exam will receive a failing grade for the course and be subject to administrative discipline.

6.1. Homework. The online homework consists of several conceptual and numerical problems that are to be completed on WebAssign by 2:30 PM on Tuesdays. **No late WebAssign homeworks will be accepted.**

You are welcome to collaborate with other students on solving homework problems, but you should try to understand how to solve the problems yourself. Keep in mind that your questions will be slightly different than those that your classmates will receive.

6.2. Comprehension checks. The weekly comprehension checks consist of exercises that should be completed on Courseworks by 2:30 PM on Thursdays. The comprehension checks will only be graded on completion and will not be graded on correctness. In other words, you will receive 100% on a comprehension check if you submit answers to all of the questions even if your answers are incorrect. These are intended to gauge your understanding, help you review material from the previous class, and prepare you for the next class. Please try your best!

Each student will be given three “free passes” for missed comprehension checks. In other words, you may miss up to three comprehension checks throughout the semester without penalty.

6.3. Exams. The course will have the following exams:

- Midterm I on **October 6** (T): 2:40pm – 3:55pm (ET)
- Midterm II on **November 17** (T): 2:40pm – 3:55pm (ET)
- Final on **December 17** (Th): 1:10pm - 4:00pm (ET)

Each exam will be administered online.

You may use your notes and textbook during the duration of the exams. There will be no need for calculators or other computational aids during the exams. When writing up your solutions to exams, show your computation and reasons. Solutions will be graded on correctness and explanation; in general, correct answers without work will not receive credit. Late exams will automatically receive a grade of 0.

Make-up midterms will not be given. Only in the case of a medical or family emergency documented by a note from a doctor or a dean, students may miss the midterm. In this case, the weight of the final will be increased proportionally.

The final must be taken at the scheduled time. If you have two final exams scheduled at the same time, it is the responsibility of the other department to provide an alternate exam.

7. DISABILITY SERVICES

In order to receive disability-related academic accommodations for this course, students must first be registered with their school Disability Services (DS) office. Detailed information is available online for both the Columbia and Barnard registration processes. Refer to the appropriate website for information regarding deadlines, disability documentation requirements, and drop-in hours (Columbia)/intake session (Barnard).

Students registered with the Columbia DS office can refer to the Master TARF section of the DS Testing Accommodations page for more information regarding disability-related academic accommodations for this course.