Calculus of Functions of One Variable II

MATH 115, Summer 2025

DESCRIPTION

This course explores some of the most powerful tools we have for computing in the modern world. Calculus lies at the heart of advances in economics, medicine, engineering, weather forecasting, artificial intelligence, and anywhere we need to analyze data. Our course explains not only how to apply these tools, but also why they work.

The two most important tools in MATH 115 are **integrals** and **series**. Integrals allow us to convert information about rates of change (like velocity or marginal revenue) into information about total change (like displacement or total revenue), and series provide a new way to define functions (Taylor series) that allows for simpler computations and numerical approximations.

MATH 115 also builds skills for problem solving and logical reasoning. These skills can help you break down complex arguments, parse computer languages, and design systems and scientific experiments.

GOALS

In Calculus of Functions of One Variable II, you will learn how to…
- compute integrals by finding antiderivatives,
- determine whether infinite series converge or diverge,
- represent and approximate functions with Taylor series,
- compute lengths, areas, and volumes of geometric objects,
- model curves using parametric and polar equations,
- work with abstract and sophisticated notation,
- develop strategies for solving complex problems,
- apply logical reasoning with mathematical concepts.

PEOPLE

Instructor. Brett Smith <brett.c.smith@yale.edu>

Graduate TA. Coming soon…

RESOURCES

Canvas.

All important information about the course (assignments, announcements, resources, important dates, and practice materials) will be posted on our course Canvas site.

Textbook.

This course follows **Calculus, Early Transcendentals, by James Stewart**. The lessons and problem sets are aligned with the sections in this book, and it is an important resource for accessing example problems, definitions, and explanations. You do not need to have the most current edition of the textbook, but *either edition 8 or 9 is recommended*.

ACTIVE CLASSROOM

This class meets three times per week to discuss the material and work through example problems. **Attendance is mandatory.** Class sessions are interactive, and you should expect to participate by working independently, collaborating in small breakout rooms, and engaging in class polls/discussions.

Active participation can feel uncomfortable and, at times, unproductive. However, active learning has been shown to increase student performance and narrow achievement gaps for underrepresented students. These learning gains are happening even when students don't feel like they are learning as much as they do in a lecture class.

SUPPORTS

Instructor Office Hours.

Your instructor has weekly drop-in office hours specifically dedicated to helping you in MATH 115. Office hours are a great opportunity to ask questions, gain a deeper understanding of the material, and get to know your instructor (and your peers). *Times and locations for instructor office hours are posted on Canvas.*

Problem Workshop

Our TA will host a weekly problem workshop to go over examples and field questions about the material. Times and Zoom links are posted on the Canvas site.

Homework Sessions

Our TA will host a Zoom room where you can ask questions and collaborate with other students on the weekly homework. Times and Zoom links are posted on the Canvas site.

Summer Session STEM tutoring

Drop-in tutoring hours are available through the Poorvu Center:
https://summer.yale.edu/academics/summer-session-tutoring

Student Accessibility Services.

Student Accessibility Services (SAS) works with all Yale students with disabilities to determine and provide appropriate accommodations and auxiliary aids and services through an interactive process.

If you qualify for accommodations with SAS, please email your accommodations letter to <brett.c.smith@yale.edu> as soon as possible.

Academic Strategies Program.

The Academic Strategies Program is designed to help students learn how to navigate the "hidden curriculum" of Yale—that invisible set of underlying assumptions and expectations about how to do well as a student that are implicitly embedded in Yale's culture and are not taught in the classroom.

Title IX.

Yale University is committed to fostering an environment of respect and belonging. An integral part of this commitment is ensuring a campus environment free of sex- or gender-based discrimination. The Title IX website gives information for accessing support, reporting options, policies and definitions, and education and outreach.

ASSESSMENTS

Explorations.

Before each class, you will complete one or two exploration quizzes on our Canvas umbrella site. The explorations reinforce prerequisite material and introduce new ideas that prepare you to engage during class. For each exploration, you will have up to four attempts to submit your answers, and only your highest score will be recorded. **The explorations are due at 9am before each class.**

Problem Sets.

We will have weekly problems sets to allow you to practice and get feedback. Wherever possible, you should explain your thinking and clearly document your work—we will assess both the clarity and correctness of your solutions. The problems will be scored according to the following rubric.

5 points	Correct with clear and complete work shown.
4 points	Minor mistakes that affect the outcome of the problem, but understanding is clear and sufficient work is shown. Or the correct solution, but some *minor* work is missing to understand the process.
3 points	Significant mistake/misunderstanding or significant step missing in work. Rough process/strategy is correct.
2 points	Incorrect strategy, but relevant effort/thought applied to the problem.
1 point	Incorrect strategy with little work shown. Or a solution with no work shown.
0 points	No attempt.

The problem sets are posted on the Canvas Umbrella site and are **due on Fridays at midnight** (or Thursdays on exam weeks). You will submit your problem sets on Gradescope, and written work should be converted to a pdf using a scanning app on your phone. If you have questions about how to scan/submit your problem sets, contact your instructor.

You are encouraged to talk with your instructor, the TA, and your peers about the problem sets. You may even consult computers and large language models like GhatGPT for guidance. However, you should try the problems yourself before working with others, and you must understand and write up your solutions without looking at anyone else's work—including online solutions and LLMs.

Exams.

There will be three exams during the semester that will take place during class time. The exams are opportunities to reflect on the concepts and skills we have learned, and to communicate your understanding of this material. The test questions will emphasize conceptual understanding over computation. **You will not be allowed to use a calculator or any electronic devices during the exams**.

Exam A: Friday, July 11
Exam B: Friday, July 25
Exam C: Friday, August 1

ACADEMIC HONESTY

Academic integrity is a core university value that ensures respect for your peers and instructors, and the integrity of your degree. We expect that students will conduct themselves in an honest and ethical manner and respect the intellectual work of others. If you have any questions about expectations regarding permissible or encouraged forms of student collaboration and use of resources, please reach out to your instructor or the course coordinator.

GRADES

Your course score will be determined as follows.

- Explorations   10%
- Problem Sets   15%
- Exam 1   25%
- Exam 2   25%
- Exam 3   25%

At the end of the semester, course scores will be converted into letter grades according to the following scale.

Percentage	100-90	90-80	80-65	65-50	50-0
Grade	A/A-	B+/B/B-	C+/C/C-	D+/D/D-	F

TOPIC SCHEDULE

The day-by-day schedule of topics and learning goals can be found in [this spreadsheet](#).