

# Math 1a: Introduction to Calculus

## Fall 2024 Syllabus

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### What is Math 1a all about?

Math 1a is an introduction to single-variable calculus, from differential calculus to the beginnings of integral calculus, relating the two with the Fundamental Theorem of Calculus. More broadly, it is an exploration of how we can model physical situations with mathematical functions and understand how systems evolve and respond to changing inputs. Some of the biggest ideas that we'll develop through the course are:

- ◆ how to translate a physical setup into a mathematical model, quantify how variables affect each other, and make predictions about how functions behave;
- ◆ how to communicate our mathematical ideas and explain the evidence, background, and precise justification for our conclusions;
- ◆ and how calculus fits in with other mathematical, physical, and scientific fields and gives us new tools, abstract reasoning, and problem-solving skills for applications.

The goals of Math 1a go beyond your learning of course content. Ultimately we hope that you will leave this course as more confident, creative, and flexible problem-solvers. Some of the meta-skills we hope to develop are:

- ◆ how to break down a problem into smaller sub-problems;
- ◆ how to see connections between different topics and problem-solving strategies;
- ◆ how to practice logical and computational resilience in the face of a mathematical challenge;
- ◆ how to work in community, both via collaboration and communication of ideas

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### Prerequisites

This is an introduction to calculus, therefore, we do not expect you to have seen any calculus before! However, we do expect a strong foundation in algebra and precalculus topics such as:

- ◆ Graphing algebraic functions, exponential and logarithmic functions, and trigonometric and inverse functions by hand
- ◆ Simplifying expressions and solving equations involving such functions (for example, using logarithm rules)

## Course Format

### Class

The core of the class is a 75-minute section meeting on Mondays, Wednesdays, and Fridays where **we'll focus on problem solving in an active learning setting, often working in groups at the board**. Each section is run by one Teaching Fellow (TF) and supported by undergraduate Course Assistants (CAs), all of whom are here to help guide you through the material.

One of the biggest ideas that guides how Math 1a is taught is that we learn best by [doing math together](#). This course won't be a passive lecture —rather, each section meeting is all about developing skills and ideas and techniques as a whole class. We want to make a collaborative and supportive environment so that everyone can learn, and where there are plenty of opportunities to ask and answer questions, explore new ideas, and communicate our strategies!

So how can you get the most out of each day and section meeting? Here are a few guidelines:

- ◆ Come to class ready to work with your classmates, and being an active participant. You'll get the most out of the meeting by *doing*.
- ◆ Be intentional about how you communicate: we all have expertise and ideas to share, so we should both take space and make space to be sure that everyone is learning.
- ◆ Celebrate mistakes and be willing to experiment! This is when a lot of our learning happens, so be fearless about sharing ideas and incrementally working towards solutions.
- ◆ Keep a growth mindset: this course is all about developing new skills and unfamiliar ideas, and that can be uncomfortable. But [mistakes really are our best learning opportunities](#).

### Workshop Quizzes

A large body of research shows that frequent testing helps people learn much more effectively than other methods of studying. Thus, most weeks, CAs from the course will lead workshops which include:

- ◆ a short quiz testing your understanding of recent material, and
- ◆ a subsequent discussion of the problems.

You can earn additional problem set drops by taking these quizzes and participating in the follow-up discussion: **for every 4 quiz sessions you complete, you will earn one additional problem set drop**. All quiz sessions in a given week will give the same quiz, so you may attend whichever session is most convenient for you.

### Materials

There are several free textbooks that are strongly recommended for this course, which can be downloaded using the links below. There will be suggested readings from the books throughout the semester. If you prefer hard copies, you can find each of them online for under \$20.

- ◆ [Active Calculus](#), an open textbook by Matthew Boelkins, David Austin, and Steven Schlicker.
- ◆ [Active Prelude to Calculus](#), an open textbook by Matthew Boelkins, David Austin, and Steven Schlicker that was designed as a companion for Active Calculus. This is a great resource for solidifying your precalculus skills.
- ◆ [Calculus: an Integrated Approach to Functions and Their Rates of Change](#), by Robin Gottlieb.

A calculator will not be required for this class. You are welcome to use a calculator or computer when working on homework, but **calculators will not be allowed on assessments**.

## Resources

There are plenty of resources available to help you as you progress through the course:

- ◆ The [teaching team](#) is here to help you. All the TFs are here to answer questions and help support your learning; this is our biggest priority of the semester. If you have any issues that come up, please don't hesitate to let us know so that we can work with you.
- ◆ Each of the TFs will also have [office hours](#), which are drop-in times when you can ask questions about course, including but not limited to the homework. Don't worry about whether you are "prepared" for office hours - no question is too small! You are welcome to attend any TF's office hours so come whenever it is convenient for you.
- ◆ The [Math Question Center](#) (MQC) will have evening hours when you can show up to ask CAs questions, work on homework with fellow Math 1a students, and review material.
- ◆ The [Academic Resource Center](#) offers free peer tutoring, academic coaching, and workshops.

Some advice for success in Math 1a:

- ◆ You aren't in this alone. Your classmates are a valuable resource, both in and out of section. Study groups can be very productive, and explaining your ideas to others will help you clarify them and get the most out of them.
- ◆ Start early with your studying! The moment you start working on a PSet, you are beginning to study for the next assessment!
- ◆ This course is cumulative; we are constantly building and strengthening the foundation. The biggest ideas of the course will build throughout the semester, so it's important to make sure that you are always pushing forward towards deeper understanding.
- ◆ There are a lot of [materials](#) to help you succeed: the textbooks, supplemental videos on Canvas, and the detailed feedback you'll receive on your problem sets and assessments. Make sure to take the time to go over these and synthesize what has gone well with your learning and what you can still work on.

## Assignments

### Problem Sets

[Problem sets](#) are written assignments designed to develop your understanding of the material from class. To make sure you keep up as new concepts are being built on top of old ones, PSets will generally be assigned every day of class and due the morning of the following day of class (3 PSets per week). PSets will be graded on correctness and your ability to communicate your work clearly and effectively - you should be writing full sentences so another person could read your work aloud and follow it!

Your two lowest PSet scores will be dropped when calculating your final grade (but you have the opportunity to get more PSet drops by attending workshop quizzes - see above). You may submit any PSets late up to 6:00 pm the day it is due without permission, but with a penalty of 25% of the credit on the assignment. If you have serious extenuating circumstances preventing you from submitting the assignment on time, such as medical illness or a family emergency, please contact your TF as soon as possible before the assignment is due. PSets will not be accepted if submitted more than 24 hours after the deadline, when solutions are posted.

Assignments will be submitted by uploading scans to [Gradescope](#). Please make sure to explain all of your reasoning, keep your work legible, and tag individual problems in Gradescope. Graded work will also be returned via Gradescope with comments about how you're doing with the material—these are very helpful and informative, so be sure to read them!

## Assessments

There will be 4 [assessments](#) throughout the semester, designed to check your progress on mastering the learning objectives of the course. Tentative dates for assessments:

- ◆ Mini-Exam: Tuesday, September 24, 6-7 pm
- ◆ Exam 1 Individual: Thursday, October 10, 6-7:15 pm  
Exam 1 Group: Thursday, October 10, 7:20-8 pm
- ◆ Exam 2 Individual: Thursday, November 14, 6-7:15 pm  
Exam 2 Group: Thursday, November 14, 7:20-8 pm
- ◆ Final Exam, date TBA

Exams 1 + 2 will have group components in addition to the individual component - these will count for 15 percent of the total exam score. In it, we will ask you to solve extension problems from the individual component of the exam in a small group, much like how we work in section!

## Course Policies

### Accessibility

If you need accommodation for a documented disability, please get in touch with the [Disability Access Office](#) as early in the semester as possible so that we can make sure your needs are addressed.

### Inclusion

This course is a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All members are expected to contribute to a respectful, welcoming and inclusive environment for everyone. When engaging in discussion with each other, we ask that you do so with care and empathy for your fellow students and teaching staff. If you ever have concerns about the above, please do not hesitate to contact a member of the teaching team.

### Collaboration

You are strongly encouraged to work with other students and collaborate on written PSets. As per the [academic integrity policy](#), whatever you submit should be written independently in your own words. Only submit work that you would be comfortable explaining to a fellow student or a TF. Generative artificial intelligence (GenAI) tools such as ChatGPT can be a useful tool for developing your understanding of a concept, but you should not ask such tools to solve your homework problems. It is unacceptable to copy a solution from any source.

## Flexibility

We understand that things can come up during the semester that may necessitate a bit of flexibility.

If you have a university-approved conflict with an assessment, you will be eligible to take an out-of-sequence assessment, which are only offered **before** the assessment. Approved conflicts are:

- ◆ A university-sponsored event such as an athletic tournament, play, or musical performance (but *not* athletic practices or rehearsals)
- ◆ A religious holiday
- ◆ An extenuating circumstance such as a medical issue or family emergency.

Important notes about out of sequence exams:

- ◆ If you have a DAO testing accommodation or a conflict with the scheduled time for the exam, you will fill out an out of sequence exam request one week before the scheduled exam to arrange an earlier time to take the exam.
- ◆ Out of sequence exams must be completed before the main seating of the exam.
- ◆ Group Exams can only be completed during the designated times. If you have a testing accommodation or valid approved conflict, and cannot attend the group portion of the exam, you will fill in the group portion of the exam by the other group exam.

If you encounter larger issues interfering with your ability to focus on the course, please contact your TF so that we can find a way to support your learning.

## Grading

### Class Participation

Attendance and participation in class will be graded on this scale:

Full credit	You arrive on time and prepared, and you stay on task and engaged in class activities for the entire class period.
Half credit	You are on task and engaged for most but not all of the class (for example, because you arrive late, leave early, or aren't focused on class material for part of the time).
No credit	You are on task and engaged for less than half of the class period.

We will excuse two class absences for the semester, but you must contact your TF with a valid reason. If you need to miss additional classes due to a Harvard-sponsored event like athletic travel, a serious illness, or an extenuating circumstance, we can excuse additional absences; please see the [FAQ](#) on the course Canvas site.

## Final Grade Calculation

Your course score will be determined by the highest of the following schemes:

Component	Scheme 1	Scheme 2	Scheme 3	Scheme 4
Homework	22%	22%	22%	27 %
Attendance and Participation	8%	8%	8%	8%
Mini-Exam	10%	10%	10%	10%
Exam 1	15%	20%	15%	15%
Exam 2	20%	15%	15%	15%
Final Exam	25%	25%	30%	25%

Course Score	Letter Grade
$\geq 90$	A, A-
$\geq 80$	B+, B, B-
$\geq 65$	C+, C, C-
$\geq 50$	D

In computing your final letter grade, we will use your numerical score on exams; we will not convert your exam scores to letter grades to compute your final grade. **Also, there is no “curve” in Math 1a, neither for particular exams nor for the final letter grade.** Lastly, there are no “grade quotas”; if you all do wonderful work, we are happy to give you all wonderful grades!