

Math 199 (Math 221 Section AD2) Syllabus Fall 2023

TA: Yigal Kamel

Email: ykamel2@illinois.edu

Office Hours: Monday, 2pm-2:50pm, Davenport Hall, Room 314
Wednesday, 3-3:50pm, English Building, Room 304.

Website: <https://yigalkamel.web.illinois.edu/M199Fa23Page.html>

Meeting Times: Wednesday and Friday, 1pm-2:50pm

Meeting Location: Davenport Hall, Room 314

Welcome to Calculus 1! In this class we will venture into the realm of infinite mathematics.

If you are in this class, you have probably spent some years building a toolkit for solving problems in algebra, geometry, and other mathematical areas through the use of functions. Despite your success, these techniques were quite limited. Maybe you know that the area of a circle is πr^2 , but what about the area of a deformed circle that you might draw with your hand? Better yet, how do we know that formula for the area of a circle is the right one? Similarly, you might've learned about slopes and lengths of lines, but how can we handle these notions for curves that aren't straight?

You might already be thinking that questions like these can be tackled by thinking small. Namely, break the “quasi-circle” or curve into small pieces and add up the areas or lengths of the pieces; zoom in on a small part of the curve until it looks straight, and then find the slope there. At a first pass, doing this will only give you an approximate answer to the problem you were trying to solve. But using smaller pieces will give a more accurate answer, and you might imagine that there is a way to use “infinitely small pieces” to get an *exact* answer. Calculus is the result of making these ideas mathematically precise.

There is a single concept at the root of all of these ideas, which is the notion of a **limit**. This is where our story begins. The “infinite zooming in” process mentioned above to approximate slope is called **differentiation**, and the process of breaking something up into infinitely small pieces and adding them together is called **integration**. A remarkable fact is that differentiation and integration are actually closely related; namely, they are roughly *inverse* processes to each other. This is made precise by the fundamental theorem of calculus. These topics and their applications are the main subject of this course.

What is Math 199? What is a Merit discussion section?

The 4 hours that we will spend together each week serve two separate courses.

For roughly 2 of these hours, our class is discussion section AD2 of Math 221 (Calculus 1), and I am your TA. This means that for that time, we will be following along with the worksheets assigned for Math 221, and your performance on these worksheets will be relevant to your Math 221 grade, as per the guidelines of that course. I do not make the content for this part of the course, and I do not assign your grades.

For the remaining 2 hours, our class is Math 199, and I am your instructor. This is the time that the word “merit” in the name of this discussion section offers us to explore the material in Calculus 1 in

a slightly different way. During this time, we will gain a deeper understanding of the material by

1. solving difficult and interesting problems by working together in groups, and
2. thinking critically about the motivation for and underlying purpose of the concepts we will study.

Part of the philosophy of the merit program is that collaborative “stuckness” is a necessary component of learning mathematics. By this I mean: struggling with a problem or concept is inevitable, and you’ll benefit greatly by working through such difficulties with your fellow students. This will involve sharing your ideas, as well as listening to your group mates’ ideas. The more paths towards a solution that you encounter, the better you’ll know the landscape. In this spirit, I will often not give you the answers/solutions to the problems we will work on, but I *will* do my best to help guide you through your collective journey into this new part of mathematics.

Grade breakdown:

This is for your Math 199 grade. Your Math 231 grade is unrelated.

Attendance: 20%
Participation: 50%
Preparation: 30%

Attendance: You will be graded on attendance.

I will drop 2 absences, no questions asked.

An excused absence will not count as a drop, but will require either verified documentation, or approval from me in advance.

Lateness: 20 minutes late = full absence and maximum 50% for that day’s preparation/participation scores.
5 minutes late = half an absence.

Participation: Your score for this part of the grade will be based on your participation with (and submission of) any activities we do *in class*. This includes worksheets, or other activities that we may do. You can raise this part of your grade by demonstrating your participation to me in other ways (e.g. coming to office hours, and being engaged with the material).

I will drop 2 participation assignment submissions.

For any additional excused absences, talk to me about making up the participation points.

Preparation: Your score for this part of the grade will be based on the work you do *before class* to prepare for class. This will include short assignments I will ask you to do (and hand in) to help stimulate class discussions about important topics. As above, you can raise this grade above your raw score by demonstrating your preparation in other ways.

I will drop 2 preparation assignment submissions.

For any additional excused absences, talk to me about making up the preparation points.

I hope you are all excited for an exciting semester of math and this great opportunity you have to engage with the material in a unique way. I am excited to get to know all of you and help you along as you progress through the course!