

**Mathematics UN1101
Calculus I
Section 001
Fall 2022
Columbia University**

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Office: 624 Mathematics.

Office hours: Mo. 10:30am-11:30am, We. 2pm-3pm, both in Room 622 Mathematics. First office hour on Monday September 12th.

Website of the course:

<https://www.math.columbia.edu/~alessandrini/Courses/Calculus1-f2022/Calculus1.html>

Classroom: Room 203 Mathematics.

Lectures: Mo., We. 11:40am-12:55pm.

Required text: Calculus: Early Transcendentals, 9th edition, by James Stewart (CENAGE Learning). The book is available at the Columbia bookstore. If you have the 8th edition or an earlier edition, that is probably fine too.

Prerequisite: No formal pre-requisites; an understanding of pre-calculus will be assumed.

Course outline: In this course we will describe some basic ideas and techniques that lie at the foundation of all pure and applied mathematics. We will discuss about functions and their limits, derivatives and integrals. We will focus on their meaning, significance, applications and methods of computation. We will use the first six chapters of the course textbook (Calculus, Early Transcendentals, by Stewart). In more detail, we will cover:

1. Functions (Chapter 1).
 - Polynomials and rational functions.
 - Roots.
 - Exponential and logarithm.
 - Trigonometric functions.
2. Limits (Chapter 2).
 - Computation of limits.
 - Continuous functions.
 - Increasing and decreasing functions.
3. Derivatives.
 - Introduction to derivatives (Chapter 2).
 - Differentiation rules (Chapter 3).
 - Maxima and minima (Chapter 4).

- Concavity (Chapter 4).

4. Integrals.

- Computation of integrals (Chapter 5).
- Applications of integrals (Chapter 6).

Electronic devices: Phones and other electronic devices must be silenced and put away during classes and exams.

Attendance: Attendance is NOT mandatory. Anyway, when skipping a lecture it is YOUR responsibility to figure out the exact content of the lecture and to stay up to date with the course and the information given in class. Usually, the best way to do this is to ask your classmates and possibly to borrow their notes. The approximate content of every lecture is given in the website of the course, with pointers to the relevant textbook sections.

Homework: Homework exercises will be published online every Wednesday night, and the solutions are due 6 days later, on the night between Tuesday and Wednesday. More precisely, the dead line for submitting will be on Wednesday early morning, at 5am. The solutions must be submitted electronically, via Courseworks, using Gradescope. We *will* accept late assignment, but we deduct 10% of the points for every day of lateness. We encourage collaboration on assignments, but it is **forbidden to exchange complete written solutions**. Feel free to ask for help to your classmates, to discuss the homework with them, or to solve exercises together. But in the end, all solutions must be written up by you alone in your own words.

Extensions: Understandably, there will be some weeks when a student doesn't manage to submit the homework on time. In order to cover for these special situations, there are three special policies.

1. If you are just a few days late, you can still submit, with a small penalty of 10% of the points for every day of lateness.
2. At the end of the semester, I will discard the two worst grades of the homework sheets.
3. If you are under severe circumstances due to your health or other factors, you can ask for an extension. In this case, please send me an email explaining your situation, and, if the request seems reasonable, you will be allowed two extra weeks to submit one particular homework sheet. The extra time is reduced to only one extra week for the last graded homework sheet at the end of the semester. Extensions can be granted only once or twice per student during the semester. Students registered with disability services may have right to additional extensions.

Students with disabilities: Students with disabilities, who are regularly registered with Columbia Health (DS) or Barnard CARDS, may be granted extra accommodations, as required by their situation.

Midterm exams: There will be midterm exams on Monday, October 3rd and on Monday, November 14th. The midterms will be during the usual class time.

Final exam: Projected schedule for the final exam: Monday December 19th, 9am–Noon. The date will be confirmed by the University in November. The date of the final exam is not under the instructor's control, and cannot be moved.

Exam dates: You *must* plan to take the midterm and final exams at the scheduled time, so please make your travel plans accordingly. Besides students with disabilities having prior arrangements with DS or CARDS, the only exceptions will be for those with an incapacitating illness, a serious family emergency, or situations of comparable gravity. In this case you will need to ask your advising dean to send me a note. If your advising dean confirms and approves your reason for skipping a midterm, I will use the grade of your final exam as grade for your midterm. For the final exam, we will organize a make-up exam in January, at the beginning of the Spring semester. Incompletes can be granted only by your advising dean and only in the circumstances mentioned above.

Academic dishonesty Anyone guilty of academic dishonesty, such as cheating on an exam or helping someone else to cheat, will fail the course and faces further academic discipline.

Grading: I will first compute a numerical final score for every student. This will depend on the homework, the two midterms and the final exam. Every week the homework will be graded from 0 to 60 points. Every midterm and the final exam is graded from 0 to 60 points. The numerical final score is computed in the following way:

Let A be the average of the homework grades (where the two worst grades are discarded). Let M_1, M_2 be the grades of the two midterms. Let F be the grade of the final exam. The numerical final score S , also from 0 to 60 points, is given by

$$S = \frac{10A + 25M_1 + 25M_2 + 40F}{100}.$$

In other words, the formula is: Homework 10%, midterms 25%, final 40%.

After computing the numerical final score for every student, I will translate them into letter grades (A,B,C,D,F) using a curve. I will choose the curve after the final exam.

Strategy

These are some guidelines to help you succeed in Calculus I. All that follows is not mandatory, but, to my experience, this is what works. Try to follow these guidelines, and everything will be easier.

This is math! Mathematics is different from most other subjects because we require students to learn how to solve problems. There is a theory that you have to learn, but this is only half of the story. You then have to apply the theory to solve problems. If you just learn the theory, you will not be able to pass the exam. The most important thing is to learn how to apply the theory and to solve some problems by yourself. For this reason, the method for learning mathematics is different from the method for learning other subjects.

Lectures Attendance is not mandatory but it is highly advisable. During the lectures I say many things that are not written in the book, or that are written in the book in a different way. In order to pass the exam, you will need to know what I said in class.

It is also important to take notes in class. If you don't take notes, you will forget everything after two days. The class notes are the foundation for your study. Some students don't like to take notes. Most of them are just too lazy for that, but this is too bad: your college instruction is important, and this is not the moment to be lazy. Some students are not able to take notes, this is again very bad: note-taking is fundamental for every course and in order to learn how to take notes, you need lots of exercise, so just start now. Some students claim that if they don't take notes, they can listen more attentively, this is a version of not being able to take notes properly: you have to learn to listen and take notes at the same time. Remember, if you don't take notes, you will forget everything I said after two days, and the exam is more than 3 months away.

After the lecture After the lecture, ideally on the same day, for example in the evening, you have to review the notes, and put them in order, possibly copying them to new well ordered notes. In doing this, you will pay attention to what's written in them, and verify that you can understand everything. If there is something you don't understand you first try to think harder about it. If you don't make progress, you can ask for help, see below. Ideally, after asking for help, you have completely understood the lecture, and you have good ordered notes that you can use for future reference.

During the lecture, I solve several exercises. When you review the lecture, you should first try to solve the exercise by yourself, without reading my solution. Then, you check my solution and you compare it with yours. Again, if there is something you didn't understand about the solution, you will need to ask for help, but it is important that you try by yourself first.

Homework The homework is published every Wednesday night, you will find it online on Thursday morning. You have to submit your solutions on Tuesday night, so you have six days time. You can manage your time as you want, but let me give you my advise.

Before starting the homework, you will need to review the Monday and Wednesday lectures of the week. Hopefully, you already did this on Monday evening and Wednesday evening, see above. There is no point at trying the homework if you don't know the content of the lectures.

In the first three days (Thu,Fri,Sat) you work at the homework by yourself. You have to check how much you can do by yourself, and you have to hope that this improves every week. There might be a few things that you don't know how to solve by yourself, mark them, because later you will need to ask for help about them.

In the last three days (Sun,Mon,Tue) you ask for help (see below) about the few things that you were not able to do by yourself. Remember that exchanging complete written solutions with the other students is forbidden, but you can discuss the homework with them, and even solve exercises together.

At the exam, you are alone, so you need to train to solve exercises by yourself. If you only work at the homework together with other people or, even worse, you just copy your homework from somebody, you are not training yourself for the exams. Asking for help is a very important part of the learning process, but your final aim is to be able to solve exercises without help.

Asking for help When you face difficulties, both when studying the theory and when working at the exercises, you first need to try and find an answer by yourself. This is very important to learn something, you have to make an effort. Sometimes, after thinking hard, you can understand everything by yourself, and this is the best way to learn. If you don't manage to do everything by yourself, don't worry, this is normal, you just need to ask for help. You can first check if there is an answer in the book, then try to ask to some classmate, or to some friend. For this, it is very useful to find a study group, a small group of classmates who meet regularly to discuss Calculus (usually no bigger than 5-6 people, or it will be too messy). If neither of this works, you can ask for help at the office hours or in the help room, we are there to help you.

WEW! Work every week It is very important to work every week. The pace of the course is quite fast, and if you fall behind it will be very hard to catch up. The most difficult month is October, with the first midterm behind you and the second one seeming so far away, several students relax and don't work seriously the entire month of October. Then they dramatically fail the second midterm, and they are desperate the rest of the course. It is OK to relax one week after the first midterm, but you cannot afford to relax for much more than that. You need at least four weeks of serious study to prepare the second midterm, and after that you need the same time to prepare for the final exam.