

MATH 1310-900: CALCULUS I

Fall 2021 Syllabus

Instructor:	Andrew Will
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WebAssign Class Key:	virginia 1695 9720
Class Meeting Times:	TR 3:30PM–4:45PM in New Cabell Hall 368 F 12PM–12:50PM in Gibson Hall 041
Office Hours:	M 11:30AM–12:30PM F 3:30PM–4:30PM or by appointment in Kerchof Hall 112

Prerequisites: A background in algebra, trigonometry, exponential & logarithmic functions.

Course Description: Math 1310 is an introductory calculus course for natural-science majors, students planning further work in mathematics, and students intending to pursue graduate work in applied social sciences (but it is open to all students).

In virtually every area of human endeavor, functions are or can be used to further understanding and to assist in making predictions. Calculus provides two fundamental tools for analyzing functions: the derivative, which represents the rate of change of a function, and the definite integral, which can be used to compute the net change of a function over an interval. Derivatives and definite integrals are defined using the notion of “limit,” which is another tool of calculus. This course introduces you to the tools of calculus and their applications.

Math 1310 is a coordinated course, which means that all sections cover the same material and take the same exams.

Inclusion: Our classroom environments should be mutually respectful and inclusive of all students. The classroom should be an environment with no discrimination, where everyone is comfortable and at liberty to contribute to, and benefit from the entire learning experience. Any suggestions to improve class interactions or any concerns should be brought to your instructor’s attention. Your small group interactions in lab are a good way to adopt this attitude of inclusion and enhance positive interactions in the larger class.

Course Design: Math 1310 is an active-learning course following a [flipped classroom](#) design.

What is a flipped classroom? In a flipped classroom, students gain first exposure to new material outside of class, usually via reading or lecture videos, and then use class time to do the harder work of assimilating that knowledge, perhaps through problem-solving or discussion. By contrast, students do the lower-level cognitive work in class and are then usually expected to focus on the higher forms of cognitive work on their own – *without* the assistance of their instructor – in a traditional, lecture-style classroom.

The formative work expected of students in a flipped MATH 1310 classroom can be divided into 3 distinct categories:

- (1) [Preparation](#)
- (2) [Participation](#)
- (3) [Review](#)

[Preparation](#) activities are completed *before* class meetings to prepare students to be successful during class. These activities are typically readings or videos accompanied by some low-stakes problem-solving. A student must complete the preparation work to be ready for class every day.

[Participation](#) activities are completed *during* class meetings to engage students with tasks designed to extend the basic knowledge developed by completing the preparation activities. This work may be graded for completion or for correctness and can take on many forms – for examples, polling questions or group activities.

[Review](#) activities are completed *after* class meetings to enhance knowledge constructed before and during class meetings. Online homework via WebAssign will often serve as a typical review activity, though there may occasionally be other kinds of homework assigned.

To assess and assist student progress, several short quizzes will be given during discussion meetings, and two, 90-minute midterm exams will be given outside of class. (See below for more information.)

Why is Math 1310 designed this way?

- Research shows that students learn more, learn more deeply, and retain more when they discuss what they’re learning with one another. We have convincing evidence that in Math 1310, students’ conceptual understanding of calculus as well as their problem-solving skills develop more when they spend a significant portion of class-time collaboratively solving problems. ¹
- A 2018 survey of over 11,000 employers worldwide indicates that

¹For example, Fall ’17, students in active-learning sections of Math 1310, on average, achieved normalized gains on the “Calculus Concept Inventory” 11% higher than those of students in traditionally taught lecture sections and scored between 5.9% and 38.2% higher on multiple choice assessment problems on the common Math 1310 final exam. Moreover, Fall ’19, when all sections of Math 1310 were taught in the active-learning style, students achieved normalized gains on the Calculus Concept Inventory 35% higher than those of students in the Fall ’17 traditionally taught lecture sections.

“ Overall, across the globe, problem solving, the ability to work in a team, and communication, are considered to be the most important skills. ”

These are precisely the skills that Math 1310 is designed to develop.

Learning Objectives: Upon completion of this course, you will

- understand, be able to describe, and be able to apply the fundamental tools that calculus provides for analyzing functions: derivatives, which represent rates of change, and definite integrals, which can be used to compute net change;
- have further developed your problem-solving skills and strategies, including
 - always introducing variables for quantities in your problem that are initially unknown to you,
 - generating different representations of objects in your problem (including pictorial ones when possible),
 - systematically assessing whether tools you have learned, both computational and theoretical, may be applied to solve your problem or provide useful insights,
 - testing a special case, or considering a simpler version of your problem (or a number of cases or simpler versions until a pattern emerges),
 - relating your problem to similar ones you’ve solved before,
 - seeking to understand every aspect of your problem from the most elementary perspective possible,
 - checking answers for plausibility;
- be able to use the tools of calculus to build and analyze mathematical models for real-world systems;
- have the ability to accurately express mathematical ideas;
- have improved your technical reading and writing skills, as well as developed confidence and competence in communicating technical information orally;
- be prepared to investigate any system or situation mathematically, mindful that deep insights typically result from analysis of examples, raising good questions, making and testing conjectures, and striving for simplicity of explanations.

Is this the right calculus class for you? Read the Mathematics Department’s [Placement Information](#).

Textbook: The course text is *Single Variable Calculus: Early Transcendentals*, 8th edition, by James Stewart (Publisher: Cengage Learning). The course will cover nearly all the material in Chapters 1–5 as well as a few sections from Chapters 6 and 9.

An electronic edition of the text is provided through the on-line homework system WebAssign, to which you must purchase access. Acquisition of a physical copy of the text is optional.² I have analyzed your different purchase options and the best one is to

- purchase [Cengage Unlimited](#) for \$119.99 on-line at the WebAssign website or through the Bookstore. *One reason this is your best purchase option is that one-term Cengage Unlimited provides multi-term access to the Math 1310-1320 course text, that is, if you purchase Cengage Unlimited this term, you’ll not have any additional textbook/WebAssign expenses for Math 1320 next term (should you choose to take it).*

No Rush! *There is a two-week grace period at the beginning of the term during which you have free WebAssign access to the text as well as course homework sets go to <http://www.webassign.net/uva/login.html> and enter our class key: *virginia 1695 9720*. You may find this video helpful [UVA Student WebAssign Class Key Enrollment](#).*

Course Grade

Your course grade will be determined as follows:

Preparation		
	WebAssign Class-prep	10 points
Participation		
	Classwork	5 points
	In-class Polling	5 points
Review		
	WebAssign Homework	10 points
	Discussion Quizzes	5 points
	Midterm Exam 1	20 points
	Midterm Exam 2	20 points
	Final Exam	25 points
		100 points possible

The number of points you earn will be mapped to a letter grade as follows:

A+: [98, 100]	A: [93, 98]	A-: [90, 93]	B+: [87, 90]	B: [83, 87]	B-: [80, 83]
C+: [77, 80]	C: [73, 77]	C-: [70, 73]	D+: [67, 70]	D: [63, 67]	D-: [60, 63]

Students earning fewer than 60 points will receive a course letter grade of F.

²The Bookstore does have some hard copies of the text.

Remarks:

- There will be no bonus opportunities in MATH 1310 other than the ones mentioned in this syllabus. See the sections on WebAssign and Piazza below for more information.
- Any grade disputes must be resolved within 1 week of the date on which the grade in question was released or the last day of the semester, whichever comes first. After that, a grade may only be changed due to errors in totalling the score.

Assessments & Activities

WebAssign Class-Prep (10 points): Before most of our 75-minute class meetings (except those dedicated to review), you'll complete through WebAssign a class-prep assignment. Through text, videos, and embedded questions, these assignments introduce the definitions, concepts, and problem-solving tools you'll be delving into during class.

Classwork (5 points): For each seventy-five minute class meeting, in order to produce complete class notes conveniently, you should do one of the following:

- (i) print out the corresponding classwork assignment (available at the Math 1310 Umbrella course site) before class and add your work to it during class,
- (ii) digitally annotate the PDF of the classwork assignment with, say, an iPad or tablet PC, or
- (iii) reproduce the classwork assignment by hand on your own paper before class and add your work to it during class

These activities will be occasionally collected for credit, with one member from each group randomly selected to submit for the entire group.

Additionally, during our 50-minute discussion meetings, we will occasionally conclude with a problem session, during which students in small groups will focus on writing up solutions having clear, logical, and correct work supporting final answers. Every student will be responsible for writing up and turning in their solutions when these problem sets happen to be collected. Work will be submitted in pdf format— see [click here](#) to learn how to convert images to pdf format.

In-Class Polling & Piazza (5 points): We will be using *Poll Everywhere* during class to enter answers to questions raised during class. In-class polling questions are worth 3 points: students earn 2 points for answering the question and an additional point for answering correctly.

Some lost polling points can be recovered using Piazza. Each week, up to 1 point can be recovered for posting a question and up to 1 point can be recovered for posting an answer to a question on Piazza. In both cases, the post must be (1) original, (2) relevant to course content, and (3) make use of mathematical notation using the math editor to receive credit. Piazza points roll over from week to week; in particular, this means points can be accumulated early in the semester to replace lost polling points later in the semester, or vice versa.

Please note that in-class polling scores will be capped at 100% at the end of the semester.

WebAssign Homework (10 points): Mathematical tools, concepts, and techniques are learned principally through their application in problem solving. Homework provides the problem-solving practice needed to develop a deep level of understanding and, equally important, a high level of confidence.

Homework for this course will be delivered through the WebAssign system: go to

<http://www.webassign.net/uva/login.html>

and enter our class key **virginia 1695 9720**. You will be allowed to attempt problems seven times, though different scoring rules may apply depending on the type of problem. You should record your work on a given problem by hand (just as if you were working through a test problem) and then enter your response into WebAssign. Whenever you get stuck on a homework problem, raise a question in Piazza or discuss the problem with me during office hours.

On most problems, a ten percent bonus will be awarded to problems correctly answered at least 24 hours before an assignment's deadline. Please note that this bonus will only restore lost points. In other words, WebAssign homework scores will be capped at 100% at the end of the semester.

Midterm Exams (40 points): Preparing for exams gives you a chance to review and reflect on what you have learned, leading to deeper understanding of course concepts, improving retention, and enhancing confidence in your ability to apply course tools and techniques. Your exam performance provides one measure of the extent of your learning and can contribute to your learning as well by, for example, revealing a misconception.

Midterm exams will be given at the following dates/times:

- Midterm Exam 1 Thursday, September 30th from 8:00PM to 9:30PM
- Midterm Exam 2 Thursday, November 11th from 8:00PM to 9:30PM

The locations of the midterm exams will be announced after the examination rooms have been reserved.

Discussion Quizzes (5 points): Quizzes will sometimes be given during the 50-minute discussion meetings. These quizzes, as well as the course content covered by these quizzes, will be announced in advance.

Tentative Schedule (subject to change)

Class Dates	Textbook Sections
August 24–27	2.1 (1.1–1.3, Appendix B)
Aug 30–Sept 3	2.2, 2.3, 2.5
Sept 6–10	2.5, 2.4, 2.6
Sept 13–17	2.7, 2.8, 3.1, Quiz 1
Sept 20–24	3.2, 3.3, 3.4
Sept 27–Oct 1	3.4, Review, Midterm Exam 1
Oct 4–8	3.5, 3.6, 3.10
Oct 11–12	No Classes—Reading Days
Oct 13–15	3.9
Oct 18–22	4.4
Oct 25–29	4.1, 4.3, 4.5, Quiz 2
Nov 1–5	4.2, 4.7
Nov 8–12	4.9, Review, Midterm Exam 2
Nov 15–19	5.1, 5.2, 5.3
Nov 22–23	5.3, 5.4
Nov 24–26	No Classes—Thanksgiving Break
Nov 29–Dec 3	5.4, 5.5, Quiz 3
Dec 6–7	5.5, Review
Dec 16	Final Exam (7PM–10PM)

Policies**• Classroom Etiquette:**

– Regular attendance is expected and full engagement in classwork activities is encouraged and rewarded through classroom polling as well as occasional collection of classwork. During class you will often be working on problems with a small group of your classmates. Here are a few comments provided by UVA students concerning introductory-calculus groupwork:

* I enjoyed the structure of the course and found that I understood the material much better because I was able to discuss it with my group members.

* This was my favorite class to come to because of the group work. I became friends with my group and feel like I got a lot better at math by talking through the problems during class time. It also made me more confident in math when I could help one of my group members.

* Though challenging, I enjoyed this course thoroughly and felt the atmosphere of the class was friendly. You are expected to contribute to making the atmosphere in your class “friendly.” Freely share your ideas with members of your group and be encouraging and supportive as they are sharing theirs. Making unsuccessful attempts at solving problems is a natural part of the problem-solving process and ideas applied in unsuccessful work can often contribute to the discovery of a solution. *Furthermore, typically more learning occurs when errors are identified and corrected than when perfect work is observed or discussed. In fact, a phrase you might often hear in class is “That’s a good mistake!”*

– The same friendly, supportive atmosphere of our classroom should, of course, extend to Piazza!

• **Calculators:** Calculators will not be allowed for any quizzes or exams. Thus, as much as possible, try to complete homework problems without using a calculator. (For some homework problems, you will find a calculator or [Wolfram Alpha](#) to be helpful.)

• **Learning Needs:** UVA is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me. If you have a disability, or think you may have a disability, you may also contact the Student Disability Access Center (SDAC), to request an official accommodation. You can find more information about SDAC, including how to apply online, through their website at <https://studenthealth.virginia.edu/sdac>. If you have already been approved for accommodations through SDAC, please make sure to send me your accommodation letter and meet with me so we can develop an implementation plan. Accommodations for test-taking (e.g., extended time) should be arranged at least 5 business days before an exam.

• **Honor Code:** The Honor Code will be strictly observed in this class. Please remember to pledge each quiz and exam.

Tips for Success

- Use class time wisely: fully engage yourself in classroom discussions & groupwork, ask questions, and make guesses.
- Seek understanding rather than trying to rely on memorized formulas.

- Take advantage of my office hours as well as the [Math Collaborative Learning Center](#).
- It is nearly impossible to understand mathematics without working problems yourself; thus, devoting sufficient time and attention to homework assignments is crucial to success in this course.
- Before beginning work on a homework-problem set, think about material discussed in class (as well as in the class-prep assignment) pertaining to the set—make sure you know and understand the definitions, theorems, concepts, and problem-solving principles emphasized in class. Try to work problems without looking at your notes or class-prep assignments. When you work homework problems without relying on notes, you're reinforcing your understanding of the principles you reviewed just before beginning work on the problem set. Also, when you take this approach each homework assignment becomes a practice test.

Communication

I encourage all students to visit me during my office hours. If you have a content-related question – e.g. about classwork or homework – to ask me, then simply tag me in a Piazza post using the @ symbol. If you have a private question – e.g. about grades – then please email me. In either case, I will try to answer all messages as quickly as possible, usually within a few hours and nearly always within 24 hours.