MATH 1310, SECTION 4: CALCULUS I SYLLABUS

FALL 2019

1. Vital Information

Instructor: Chris K. Chung
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Class times and locations: MoWe 2 pm–3:15 pm (New Cabell Hall 368) and Th 8am–8:50am (Monroe 118)
Instructor's Office Hours: Mon 12:30 pm–1:50 pm, Fri 1 - 2:20 pm & by appointment. (Hours subject to change.)

1.1. Important Dates.

Classes Start	Tuesday, August 27th
Last day to add a course	Tuesday, September 10th
Last day to drop a course	Tuesday, September 10th
Midterm Exam 1	Thursday, October 3rd, 7–8:30 p.m.
Last day to withdraw from a course:	Tuesday, October 22nd
Midterm Exam 2	Thursday, November 14th, 7–8:30 p.m.
Last day of classes	Friday, December 6th
Final Exam	Tuesday, December 10th, 7–10 p.m.

Contents

2. About the Course

2.1. **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). Calculus might be defined as a mathematical toolkit for analyzing functions. 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.

2.2. **Prerequisites.** A background in algebra, trigonometry, exponential & logarithmic functions, and analytic geometry.

2.3. **Course Design.** All sections of Math 1310 are based on active- and cooperative-learning strategies designed to further develop students' problem-solving skills applicable in any situation.

During our Monday and Wednesday class meetings, at least 70% of the time you will be engaged in groupwork with your classmates; the rest of the time will be devoted to mini-lectures (by me), problem-solution discussions (led by students), and whole-class discussions of concepts, techniques, and problem-solving principles. During our final class meetings on Thursdays, we will review topics from the first two class meetings of the week and typically have a quiz on those topics. For our Monday and Wednesday class meetings, you'll be expected to familiarize yourself—through on-line class-prep assignments—with the basic notions and ideas that will play a role in class. A question you may have is "Why is Math 1310 designed this way?"

- Research shows that students learn more, learn more deeply, and retain more when they discuss what they are learning with one another. We have convincing evidence that in Math 1310, students' problem-solving skills develop more when they focus the majority of class-time on collaborative problem solving.[1]
- A 2018 survey of over 11,000 employers worldwide indicates that "*Overall, across the globe, problem solving, the ability to work in a team, and communication, are considered to be the most important skills. There is a large skills gap in relation to problem solving, with employers giving it an importance factor score of 96, but a satisfaction factor score of just 67.*"

2.4. **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 special cases, or considering a simpler version of your problem (or a number 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-word 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 able to describe fundamental problem-solving skills and strategies and be able to apply them in any situation.

2.5. **Is this the right calculus class for you?** Read the Mathematics Department's Placement Information (link).

2.6. **Textbook.** The course text is *Single Variable Calculus: Early Transcendentals*, 8th edition, by James Stewart (Publisher: Brooks/Cole 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. You have a number of different purchase options:

(1) purchase Cengage Unlimited on-line at the WebAssign website or through the Bookstore ($119.99, includes multi-term access to Stewart as well as fall-term access to virtually any resources Cengage offers).
(2) purchase WebAssign through the WebAssign website ($100 single term, $125 multi-term).

[1] For 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 sections and scored between 5.9% and 38.2% higher on multiple choice assessment problems on the common Math 1310 final exam.

(3) purchase a WebAssign-access through the UVA Bookstore ($117.19, multi-term),
(4) purchase, through the Bookstore, a bundle consisting of a hard-copy of the textbook plus WebAssign ($129.41, single-term).

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 4068 0096****.* You may find helpful the video UVA Student WebAssign Class Key Enrollment (link).

3. Assessments

Sunday	Monday	Tuesday	Wednesday	Thursday
• WebAssign HW due (11:59pm)	• Class Prep due (1:30pm) • Groupwork class (2:00pm) • [Optional] Quiz Augmentation due (2:00pm)	Nothing due!	• Class Prep due (1:30pm) • Groupwork class (2:00pm)	• Reflections due (7:00am) • Discussion class with quiz (8:00am)

Table 1. Weekly Assesment Overview

3.1. **Homework.** You will be completing both on-line homework and written homework. On-line homework will be delivered through WebAssign (webassign.net/uva/login.html). Some on-line homework—"class-prep" assignments—constitute an interactive textbook for Math 1310—much shorter than the actual one. Moreover, unlike the full textbook, everything in these assignments (except for optional linked materials) is directly relevant to your success in the course. Questions embedded in the class-prep assignments make sure you understand what you are reading and watching. The submission deadline for class-prep assignments will be thirty minutes before our class meeting time.

Because the WebAssign system will evaluate only your final answers, it's important that you have opportunities (other than on quizzes and exams) to have your work evaluated as well your final answers. Thus, roughly every other week, I will collect written homework. Problem sets will be posted on Collab and some of the problems appearing in these sets will be drawn from old common exams for Math 1310. I strongly encourage you to work in groups (of up to four students) on written homework assignments. Research shows that students learn more and learn more deeply when they discuss their problem-solving ideas with other students (as well as evaluate other students' problems-solving ideas). *If you choose to work in a group, you still must write-up your own final solutions; moreover, in the top margin of the first page of your submission, you must record and sign the following statement, "I worked on this assignment in a group with [name the other members of your group—up to 3]. We wrote-up our own final solutions, and we checked each other's solutions for correctness."*

3.2. **Quizzes.** Quizzes will be given during Thursday class-meetings (except the first one). They will consist of two to three problems that will help you to assess whether you learned the basic concepts and problem-solving techniques treated earlier in the week. One problem on each quiz will be an in-class groupwork problem considered earlier in the week. If you are not satisfied with your performance on a given quiz, you may choose to submit for evaluation a "quiz-augmentation set" consisting of three problems that you will complete as written homework problems, submitting them at the beginning of the next class meeting. Quiz-augmentation problems count as if they were quiz problems and can have a big impact on your quiz score. For instance, suppose a quiz consisted of two problems and your score, based on those two problems, is 50/100. If you submit the associated quiz augmentation set, answering correctly all three of its problems, your final grade on the quiz would be $(2/5)(50) + (3/5)(100) = 80$. Quiz augmentation work can only boost a quiz score; in other words, if an augmented-quiz score is lower than your original quiz score, then the original score will stand. In computing your final quiz average, I'll drop your lowest quiz score. Make-up quizzes will only be given under very special circumstances.

3.3. **In-Class Work.** At the beginning of our Monday and Wednesday class meetings, I'll describe the learning goals you should have for the class; then I'll distribute a classwork assignment designed to help you reach these goals. You'll be completing classwork assignments collaboratively, in a small group of fellow students. Most classwork assignments begin with a multiple-select problem with four possible choices, at least one of which is correct. Each group member considers (at least) one of the choices for correctness. After a minute or two of individual thought, group members make a case for selecting or not selecting the choices they've analyzed. The group collaboratively decides which choices are correct and each member records the group's "final decision" on his/her classwork assignment. The following course policies reward students for fully engaging in classwork activities:

- One problem on each quiz will be an in-class groupwork problem.
- I will occasionally collect classwork assignments. Assuming all group members have been actively collaborating, one member's assignment will be chosen for collection by a random process. Problems will be graded as follows:

- If a problem has been presented/discussed by the class as a whole, then the problem will be graded for correctness—both the answer and the work.[2]
- Multiple-select problems will always be discussed in class. If your group has the correct answer to the multiple-select problem, put a big checkmark by the answer (honor system!) and your group will get a bonus point on the collected assignment.
- If a problem has not been discussed by the class as a whole, then you may earn credit for the problem even if you haven't obtained a correct solution—your work must show you have explored a least one potential path to a solution (e.g. on an abstract problem, you've worked through a concrete example shedding light on the problem; or, on a difficult concrete problem, you've considered a simpler version of the problem).

Points earned on collected classwork assignments are counted as points earned on the next course exam. See the section "Exam-Credit Points" below.

3.4. **Piazza.** As you work through class-prep assignments and complete on-line homework assignments, it's likely that questions will occur to you. Those that occur to you will likely also occur to other students. You should raise these questions at our class's Piazza Q & A site, accessed through Collab. (The name *Piazza* comes from the Italian word for plaza—a common city square where people can come together to share knowledge and ideas.) Your Piazza activity can yield up to five exam-credit points on the next course exam (see the Exam-Credit-Points section).

Piazza is intended for discussions of questions relating to

- on-line homework (including class-prep assignments),
- problems appearing on practice exams, and
- general questions about course concepts.

Piazza is not the right forum for questions about specific written homework problems or about problems on a course exam you recently completed.

3.5. **Reflections.** During the first two class meetings of each week, you will be exploring new course topics through collaborative problem solving with your classmates. During the final class meeting of the week, we'll be revisiting topics, concepts, and problem-solving techniques that students believe require further discussion. Students will identify what course material needs to be revisited through weekly submissions of course-related reflections. Responses to the following prompts are to be submitted through Collab after the 2nd class meeting of the week and at least one hour before the final class meeting of the week:

- What is the most important thing you learned so far this week?
- What topics/concepts/techniques, if any, would you like to revisit during our final class meeting this week?
- Identify specific classwork problems on this week's assignments (if any) that you found especially challenging and would like to discuss further.
- What is going well—what aspects of the class are facilitating your learning? What is not going well?
- Please explain how your group is working.

For each thoughtful reflection-statement you submit, you will earn one exam-credit point.

3.6. **Encouraging Outside-of-Class Discussions.** As part of a Provost's Office initiative, Math 1310 students in this section may earn some exam-credit points for participating in study-group meetings organized by one of six study-group coaches. The sign-up period for study-groups will be September 2nd-6th. Study-group meetings, which will be 1–1.5 hours long, begin with discussions of questions students have about any aspect of the course, including those about on-line and written homework. Then, study-groups coaches will have students work on "practice problems" on current course material with each practice problem being from an old Math 1310 exam. Students will work on a given practice problem individually, and then discuss the probem in, say, pairs. Then, there will be a groupwide discussion of key ideas, proper notation and terminology, and typical errors students might make on a similar problem.

v = **Number of visits to study-group**	**Extra Credit**
$v \leq 2$ visits before Exam 1	0 exam-credit points on Exam 1
$v = 3$ visits before Exam 1	6 exam-credit points on Exam 1
$v \geq 4$ visits before Exam 1	8 exam-credit points on Exam 1
$v \leq 2$ visits between Exam 1 and Exam 2	0 exam-credit points on Exam 2
$v = 3$ visits between Exam 1 and Exam 2	6 exam-credit points on Exam 2
$v \geq 4$ visits between Exam 1 and Exam 2	8 exam-credit points on Exam 2
$v \geq 1$ visit after Exam 2	2 exam-credit points on Final Exam

TABLE 2. Outside-of-Class Discussion Extra Credit

[2]thus, if a discussion of a classwork problem reveals errors or incompleteness in the work you have recorded, you should correct your work. which might mean inserting a needed step or erasing and replacing a portion of your work; or perhaps, even scratching out incorrect work and squeezing in correct work.

3.7. **Exams.** Recall that one objective of the course is improvement of your problem-solving skills. To motivate you to develop these skills as well as to give you an opportunity to show you understand how to choose and apply appropriate calculus tools in your problem solving, exams will include some problems that are somewhat different from those you've solved before (but for which you have learned tools and strategies that will produce solutions).

There will be two evening midterm exams given during the semester. The exams are common to all sections of MATH 1310. The dates of these exams are as follows:

- **Midterm Exam 1:** Thursday, October 3rd, 7–8:30 p.m.
- **Midterm Exam 2:** Thursday, November 14th, 7–8:30 p.m.

Midterm exams may not be taken early. They may be postponed only because of conflicts with UVA academic or athletic obligations, serious illness, or a family emergency. For those students who have a time conflict with another course, a make-up exam will be given the following morning beginning at 7:20 am. If you have a direct conflict with either of the above listed exam times, please notify me as soon as possible AND at least one week before the exam date. If proper notice cannot be given, then a request for the make-up exam will be honored only in cases of extreme emergencies and at my discretion. Midterm and final exams will be graded in common, with all Math 1310 instructors participating.

The **final exam** will be held during the time specified by the university, which this semester is Tuesday, Dec. 10th, 7:00–10:00 PM. It is University policy that finals may not be taken early. The final exam is comprehensive.

3.8. **Exam-Credit Points.** As noted above, you can earn exam-credit points (on the next course exam) for

- collected classwork assignments (up to seven points per assignment, plus possible bonus point for multiple-select problem),
- Piazza activity (five points),
- thoughtful reflection-statements (1 per submission),
- study-group participation (up to 8 points on each of Exams 1 and 2; up to 2 points on the final exam).

Comment regarding Piazza points: you can earn a five-point Piazza credit on the next course exam for contributing five or more "helpful Piazza posts," where a *helpful post* is defined to be "a good question" or "a thoughtful response to another post. (Fewer than five posts yields no exam-credits.)

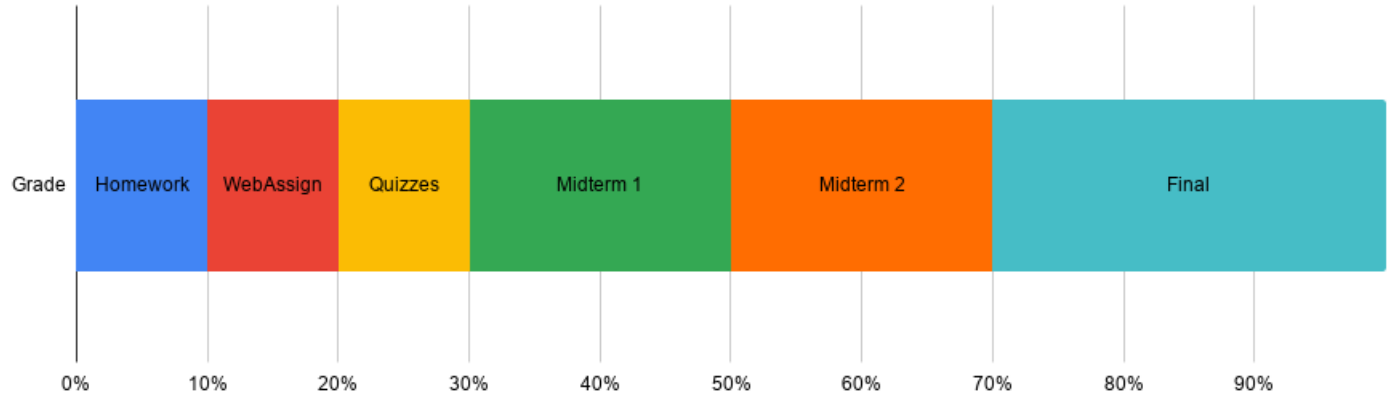
Exam-credit points are added to the numerator and denominator of your exam score. Example: If your raw score on Exam 1 is 75/100, but you have 37 exam-credit points, then your final score on Exam 1 would be $112/137 \approx 82$.

4. Course Grade

Your course grade will be determined as follows:

Written Homework	10 points
WebAssign Homework[a]	10 points
Quizzes	10 points
Midterm Exam 1:	20 points
Midterm Exam 2:	20 points
Final Examination:	30 points
	100 points possible

[a]The maximum number of WebAssign points you can earn is 10. Thus, if early-submission WebAssign bonuses yield a final average over over 100%, you will earn 10 points (not more).



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)

In borderline cases, your letter grade may be higher—the one assigned to the interval immediately above the one your point total lies in.

5. Calculus Concept Inventory

This fall, as part of an on-going evaluation of the effectiveness of its Calculus I course (Math 1310), the Mathematics Department will be administering on-line a pre-course and post-course survey as well as a two-part "paper-and-pencil" test: the Calculus Concept Inventory (CCI), which has both pre-course and post-course components. Every student enrolled in Math 1310 this term is expected to complete both parts of the survey and both part of the CCI.

You may complete Part 1 of the CCI the evening of August 27th, 28th, or 29th. Choose the evening most convenient for you and report to Maury Hall, Room 209 between 7 and 8:30 p.m. Completing the test should require about 30 minutes. Part 2 of the test will be offered during the final week of classes, December 3rd, 4th, and 5th.

Calculators may not be used during CCI testing. The only thing you need to bring with you to a testing session is a pencil.

Failing to complete either part of the CCI, or course survey, will negatively impact your course average, perhaps resulting in your receiving a lower final grade. Specifically:

- If you fail to take Part 1 of the CCI or complete the attitude survey, you will be assigned a score of 0 on the first quiz of the term and lose 2 points on the first common exam of the term.
- Your work on Part 2 of the CCI and completion of the post-course attitude survey will account for 5 of the 100 points on the Math 1310 common final exam as follows—you will receive 1 point for taking Part 2, 1 point for completing the post-course attitude survey, and may earn up to 3 performance-based points.

6. Policies

6.1. **Attendance and Classroom Etiquette.** Regular attendance is expected as is full engagement in classwork activities. Please arrive on time, turn off your cell phone, and stay for the entire class period. **You may not use any electronic device during class**. (One exception: if you are using a laptop to run *WolframAlpha*.) Studies suggest that student multi-tasking during class through use of smart phones and laptops hinders classroom learning for both users and *nearby peers*.

During the Monday and Wednesday class meetings of this course at least 70% of the time you will be engaged in groupwork with your classmates. Here are a few comments concerning the format of Math 1310 classes that students have provided on course evaluations:

- I was intrigued about doing pretty much all group work. It works and creates bonding.
- 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 this 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.*

6.2. **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.

6.3. **Calculators.** Calculators will not be allowed on the quizzes, midterms, or the final exam.

6.4. **Exam-grading Concerns.** After receiving a graded exam, you have 1 week (7 days) to raise concerns about grading errors. Graded exams are scanned. *If you ask for a re-evaluation of the grading of a problem on an exam and you have altered any portion of your original work on the problem, your exam score will be changed to 0.*

6.5. **Honor Code.** The Honor Code will be strictly observed in this class. Please remember to pledge each quiz and exam. Any student found guilty of an honor violation relating to Math 1310 will be assigned a course grade of F.

7. Resources and tips for success

7.1. **Tips for success.**

- Use class time wisely: fully engage yourself in class activities, asking and answering questions when appropriate.
- Seek understanding rather than trying to rely on memorized formulas.
- Your classmates are an important resource! Spend time out of class asking questions to each other and teaching each other.
- Take advantage of your instructor's office hours as well as the Math Collaborative Learning Center.

7.2. **Office Hours.** Office hours are a time for students to drop by the instructor's office **without an appointment** to ask questions or discuss matters related to the course. However, it is expected that you will have already formulated your questions and attempted to answer them prior to showing up at office hours. Note that office hours are **not remedial** and, in fact, many of the strongest students regularly attend office hours.

Figure 1. How to find my office

8. Course Content

8.1. **Topics.** Topics to be covered in Math 1310:

(1) FUNCTIONS AND MODELS. Just-in-time review, during first six week of course, of the following: Four Ways to Represent a Function. Mathematical Models: A Catalog of Essential Functions. New Functions from Old Functions. Exponential Functions. Inverse Functions and Logarithms, Trigonometric and Inverse Trigonometric Functions.
(2) LIMITS AND DERIVATIVES. The Tangent and Velocity Problems. The Limit of a Function. Calculating Limits Using the Limit Laws. The Precise Definition of a Limit. Continuity. Limits at Infinity; Horizontal Asymptotes. Derivatives and Rates of Change. The Derivative as a Function.
(3) DIFFERENTIATION RULES. Derivatives of Polynomials and Exponential Functions. The Product and Quotient Rules. Derivatives of Trigonometric Functions. The Chain Rule. Implicit Differentiation. Derivatives of Logarithmic Functions. Rates of Change in the Natural and Social Sciences. Related Rates. Linear Approximations and Differentials.
(4) APPLICATIONS OF DIFFERENTIATION. Maximum and Minimum Values. The Mean Value Theorem. How Derivatives Affect the Shape of a Graph. Indeterminate Forms and l'Hospital's Rule. Summary of Curve Sketching. Optimization Problems. Antiderivatives.
(5) INTEGRALS. Areas and Distances. The Definite Integral. The Fundamental Theorem of Calculus. Indefinite Integrals and the Net Change Theorem. The Substitution Rule.
(6) APPLICATIONS OF INTEGRATION. Areas Between Curves. Volume by Slicing. Average Value of a Function.

8.2. **Tentative schedule.** This schedule is subject to change.

Class Dates	**Textbook Sections**
August 27–30	2.1 (1.1–1.3, Appendix B)
Sept 2–6	2.2, 2.3, 2.5
Sept 9–13	2.4, 2.6, 2.7
Sept 16–20	2.7, 2.8, 3.1
Sept 23–27	3.2, 3.3, 3.4
Sept 30–Oct 4	3.5, Review, Midterm 1 (Thursday)
Oct 7–8	No Classes—Reading Days
Oct 9–11	3.6, 3.10,
Oct 14–18	3.9, 4.4
Oct 21–25	4.1, 4.3, 4.5
Oct 28–Nov 1	4.2, 4.7
Nov 4–8	4.9, 5.1, 5.2
Nov 11–15	Review, Midterm 2 (Thursday), 5.3
Nov 18–22	5.3, 5.4, 5.5
Nov 25–26	6.1, 6.5
Nov 27–29	No Classes—Thanksgiving Break
Dec 2–6	6.2, Review for Final Exam

TABLE 3. Tentative Schedule