

Syllabus for Math 212: Multivariable Calculus

Morgan Weiler, Rice University, Spring 2021

Time: MWF 1:30-2:25 Central. No class: W 2/17, M 3/1, F 3/26.

Room: Canvas, Zoom, Gradescope, Piazza, WebWork, and <https://math.rice.edu/~mw79/s21math212.html>; all important information and virtual “locations” will be linked from Canvas. You should have already been added to Gradescope and Piazza, so please do not add yourself as this may affect proper syncing with Canvas. If you have any issues accessing online platforms, please contact me. WebWork login details are below under “Homework.”

Text: Chapters 2-6 of OpenStax, *Calculus Volume 3*, available at <https://openstax.org/details/books/calculus-volume-3>

Exams: The midterms will be on Thursday, March 4, and Tuesday, April 6, from 7-9 PM, Central. There will be an alternate early exam time for students in different time zones. Details about the final are TBA.

Getting help: Your first resource for getting help outside of class is **Piazza**, where you can ask and answer questions of your classmates; I will check Piazza periodically throughout the week. The math department hosts **calculus help sessions** several times a week, exact info TBA. My **office hours** are Wednesdays 6-7 PM and Fridays 10-11 AM Central, on Zoom. Office hour times may change in the week before an exam.

Contacting me: **Use Canvas or Piazza messages to contact me instead of email.** I will do my best to get back to you quickly during work hours.

Honor code: All your work in this class is pledged, meaning that you must follow the stipulations of this syllabus, as per the Rice honor code <http://honor.rice.edu/>.

Outline of topics: In this course, will study differentiation and integration in two and three dimensions. What do we mean by that?

- If you’ve lived in Houston, you know that temperatures can vary wildly from place to place. The temperature at a given spot on the map is not just a function of one variable, but of two: the latitude *and* the longitude of that spot. Not only that, but temperature can vary with time – three variables! – or altitude – four! There are many examples of such “multivariable” functions in mathematics, science, and engineering.
- We want to apply the techniques of calculus to such functions, such as using derivatives to solve optimization problems (finding the hottest or coldest place in Houston, in our example).
- We also want to understand how to integrate in two and three variables. One example is to use integrals to find the mass of a three-dimensional solid, or how many square feet of netting you’ll need to keep the squirrels out of your ellipsoidal garden plot. It turns out there are many ways to generalize integration to higher dimensions, and to do so we need to first study “vectors” (which you may have seen in a linear algebra class).
- Along the way, we will learn how to model curves and surfaces in three dimensions using functions and “parameterizations,” and learn how to relate the different types of two- and three-dimensional integrals to one another via Green’s Theorem, Stokes’ Theorem, and the Divergence Theorem.

Assessment: Your grade will be computed using the following formula:

$$25\%(\text{homework and WebWork}) + 5\%(\text{participation}) + 70\%(\text{exams})$$

Your exam grade will be distributed amongst MT1/MT2/Final in one of the three following ratios, whichever benefits you the most: 4:4:5, 4:3:6, or 3:4:6.

Important note about final grades: The aim in Math 212 is that letter grades should not depend on whether a student's section is an "easy" or "hard" section. To that end, when computing final course grades, a student's exam scores are normalized against exam scores of all students in Math 212 this semester (not just those in this section), while a student's non-exam scores are normalized against the non-exam scores of students in this section. In particular, students should not assume that having higher raw scores on homework than on exams will necessarily increase their final letter grade.

I will not accept late assignments, but I will drop your lowest two homework and WebWork scores (they do not need to be from the same week), and will excuse up to four absences (see the section on Attendance/Participation below).

Logistics: Here's an outline of your responsibilities for a typical (non-exam) week:

Videos and reading: By each Friday I will post the next week's reading and videos to Canvas (usually they will be posted much earlier than that). You should have watched all posted videos before each class period. I recommend also doing the reading before class, though it is not required. However, if you have a question about some topic covered in the videos, in class, or on the homework, your first resource should be to read through the appropriate section of the book.

Class time: We will split class time between mini-lectures to fill in the details of topics introduced in the videos and reading, and working on worksheets in small groups. I will post my solutions to the worksheet the day after each class.

I will post the recording of each class period to Canvas after class is over, so that asynchronous students may watch it.

Small groups/Worksheets: We will be working with the same small groups throughout the semester; hopefully these can form a starting point for homework and exam study groups as well. In the first two weeks, I will assign groups randomly. **At the end of the second week, I ask you to submit a survey which I will use to sort you into permanent groups.** We will revisit the groups in the middle of the semester in case anyone wants to make changes.

During class, you will work on a worksheet in your group. (There will be no worksheet for the first class meeting on 1/25.) **You will each turn in your own worksheet right after class,** on Gradescope (the assignment will be due an hour after class, to give you time to submit).

Attendance/Participation: **Your participation grade will be based on your submission of the daily worksheet.** It will not be graded on correctness; you will receive full credit if you have reasonably attempted most of the problems.

Asynchronous students: In-class attendance is not required if you are not in the Central time zone ± 1 hour, or if you have another reasonable excuse. (However, I encourage you to attend class if you are able to, even if you are ± 2 hours away from Central time.) If this is the

case for you, I will assign you a small group of students in similar time zones. You should work on the day's worksheet together, and each **submit it by 12 midnight Central time** (the extra time is to account for difficulties with finding a time to meet, since you may be in different time zones, and to allow you to watch the video of our class meeting, if necessary). You will not be required to meet in groups during the first week (before I have set groups using your survey responses).

Homework: You will have a homework assignment, consisting of written problems and WebWork problems, **due every Friday at 5 PM Central**. The written problems will be posted to Canvas by the Friday before. To log in to WebWork at <https://webwork.math.rice.edu/webwork2/Math212Spring21Weiler>, use your Rice NetID (without the @rice.edu) as your login, with your Student ID (S followed by 8 digits) as your initial password (which you can change after you log in).

You are encouraged to work together on the homework, though you must write up all your solutions yourself. The best way to learn from homework, I have found, is to first work on the problems by yourself, then to discuss anything you are stuck on with your study group.

You are not allowed to use software (including calculator functions beyond basic arithmetic) on homeworks or exams. However, you are encouraged to use mathematical software (e.g. Wolfram Mathematica) to help you study, especially for visualizing functions.

Gradescope: You must submit your work as a PDF (other file formats are possible, but the most failsafe option is to use a PDF). For help with Gradescope, click on "Account" (at the bottom left), then "Getting Started Guide."

Exams: Exams will be submitted via Gradescope. Further details regarding exam logistics will be provided closer to exam times. Exams will be closed book/notes/internet. You are not allowed to use software (including calculator functions beyond basic arithmetic) on homeworks or exams. You will not be allowed to access any outside resources or, before 9 PM Central on the date of the exam, to discuss the exam with anyone besides an instructor.

If you have a conflict with the exam dates (3/4 and 4/6) you must let me know by the end of the first week of class. Otherwise, no excuse other than a documented medical or family emergency will be accepted for missing the exam, and your grade for the exam will be zero.

The date for the final exam is set by the Registrar's office and is not available at this time. It is the policy of the Mathematics Department that no final may be given early to accommodate student travel plans. If you make travel plans that later turn out to conflict with the scheduled exam, then it is your responsibility to either reschedule your travel plans or take a zero on the final.

Accommodations: If you require accommodations due to a disability, please let me know *at least two weeks in advance* of the part of the course for which you will require an accommodation. Please also make sure this documentation is on file with Disability Resource Center (Allen Center, Room 111/adarice@rice.edu/x5841) to determine the accommodations you need.

This semester may present unique challenges to all of us due to COVID-19. Please let me know if there are any unexpected or unusual difficulties which significantly impact your ability to engage with the course.

Statement on collegiality, respect, and sensitivity: The Dept of Mathematics supports an inclusive learning environment where diversity and individual differences are understood, respected, and recognized as a source of strength. Racism, discrimination, harassment, and bullying will not

be tolerated. We expect all participants in mathematics courses (students and faculty alike) to treat each other with courtesy and respect, and to adhere to the mathematics department standards of collegiality, respect, and sensitivity

`math.rice.edu/departement-statement-collegiality-respect-and-sensitivity`

as well as the Rice Student Code of Conduct. If you think you have experienced or witnessed unprofessional or antagonistic behavior, then the matter should be brought to the attention of the instructor and/or department chair. The Ombudsperson is also available as an intermediate, informal option, and contacting them will not necessarily trigger a formal inquiry.

Title IX statement: Title IX Responsible Employee Notification

Rice University cares about your wellbeing and safety. Rice encourages any student who has experienced an incident of harassment, pregnancy discrimination or gender discrimination or relationship, sexual, or other forms interpersonal violence to seek support through the SAFE Office. Students should be aware when seeking support on campus that most employees, including myself, as the instructor, are required by Title IX to disclose all incidents of non-consensual interpersonal behaviors to Title IX professionals on campus who can act to support that student and meet their needs. For more information, please visit `safe.rice.edu` or email `titleixsupport@rice.edu`.

This syllabus is subject to change at any time. I will do my best to inform students of all such changes as quickly as possible.