

Basic Information

Instructor: Prof. Paulhus paulhus@math.grinnell.edu

I do not check email between 9 PM and 7 AM on weekdays, and only infrequently on the weekends. I will make every effort to respond to emails within 24 hours.

My Office Hours: Wednesday 10 -11:50 AM *or by appointment*.

Class Webpage: paulhus.math.grinnell.edu/teaching/ma133s21.html

Class Meetings: 10-11:50 AM Monday and Friday, 10-11:15 AM Tuesday and Thursday

Zoom Links: See PioneerWeb (PWeb) page

Text: *Calculus*, James Stewart, 6th Edition

Material Covered: We will cover Chapters 8 and 13-16 of the textbook. We will also cover parts of Chapters 11 and 17. Our goal is to interpret and redefine ideas of derivatives and integrals to functions with many variables.

Learning Goals

This course is designed to aid you in several explicit learning goals. By the end of the semester, a student who is successful in this course will:

- understand the motivation for, and crucial concepts of, functions of several variables
- generalize and extend the computational procedures from Calculus I to the multivariable setting,
- develop geometric visualization and reasoning skills,
- be prepared to apply the course topics in their own field of study, and
- develop skills to work well with a diverse group of colleagues.

Growth toward these goals will be measured by the student's ability to solve computational problems, interpret and solve word problems, explain conceptual ideas from the class, and interact well with all members of the class.

Grading Breakdown

- homework 15%
- quizzes 8%
- in-class exam with the lowest score 10%, other in-class exams (2) 15% each
- final exam (cumulative) 20%
- daily definition/concept sheet 7%
- engagement 10%

Grading Policies

Homework Assignments

Homework assignments are **due by 9:50 AM Grinnell Time almost every Monday, Tuesday, Thursday, and Friday**. Assignments will be listed on the class webpage. The assignments will consist of several required problems which are to be turned in to be graded, as well as additional problems which you may choose to solve at your discretion but should not be turned in. No late homework will be accepted but the lowest three homework scores will be dropped. Homework will be submitted on Gradescope. Due to time restrictions for the graders, not all the turned in problems will necessarily always be graded. **Show your work on the homework. Answers with no work will receive zero points.**

Quizzes

One to two times a week (typically on Mondays and Thursdays) there will be a timed quiz posted on Gradescope. You will have 36 hours to start the quiz, and 30 minutes to take the quiz once you start it. Don't use anything to help you except a basic calculator. The quizzes will be graded on whether you made an honest attempt, not on correctness (and I will post solutions for you to check your answers). The goal of the quizzes are to give you frequent, low-stakes opportunities to test your knowledge and understanding so far in the class.

Exams

There will be three in-class exams scheduled for every other Thursday: **February 11, February 25, and March 11**. No make up exams will be given, unless agreed to beforehand so contact me immediately if any issue arises with the scheduled exams.

Final

There will be a cumulative final on **Wednesday, March 24 from 9AM-12PM**.

Concept/Definition Sheet

Before every class you will be given a list of a few words or basic concepts which will be covered that day. You should spend about 10-15 minutes before every class writing down the definitions or brief explanations for these words. Every class you should add the new words to the previous ones so by the end of the semester you have a list of most of the concepts in the course. You may choose where you want to save these lists, but you must share the document with me (so through Google Docs, for example). I am happy to set up a shared file in OneDrive for you to use if you would like. I will be sporadically check the word list and, like the quizzes, grading for completeness.

The reason for the sheet is threefold: (a) reading math before the lecture can make a big difference in understanding the lecture, (b) this sheet will be a ready-made study guide for exams, and (c) you will have all the definitions easily accessible during class in case I mention a word and you cannot quite remember the definition. In class, I will sometimes ask you to look up a concept on your sheet.

Engagement

The final part of your grade is to gauge how well you have engaged with the class and the material. Your collaboration with group members during class, your contributions to questions or discussions in class, your questions in my office hours, or helpful posts on Piazza can each positively impact this part of your grade. While I will not officially take attendance, if you miss a lot of classes or if you are perennially late for class, your engagement grade will suffer.

Online Learning

Having the self motivation and discipline to work independently from home is very difficult for humans when conditions are good, let alone when the world around you is pretty much a dumpster fire. Most of us are craving structure in our lives and clear goals we can work towards. I will, therefore, set explicit deadlines for each homework and quiz, and enforce homework, quiz, and exam deadlines. I anticipate this will be beneficial for almost all of you.

That being said, these are very strange and difficult times. If anything comes up which makes it hard for you to keep up with the work in this class (e.g., illness, travel home, or family obligations), let me know and I can work with you to make another plan.

We are all going to have to deal with unexpected interruptions, technology not working right, and just generally bad days. **It's imperative that you keep up good communication with me if you run into issues or have questions.**

Class Policies

Warm-up Exercises

I will be on Zoom by 9:55 AM each morning we meet. Classes will begin with a warm-up exercise posted on PWeb. The warm-up exercises help us reset our frame of mind to be ready to engage with mathematics. I will place you into random breakout groups each day to work together on the warmup, and the warmup period will conclude at approximately 10:05 AM. You should be online by 10:00 AM to start working on the warmup. If you are regularly late to class, your engagement grade will suffer.

Short Discussions

Up to a few times each class period (including at the beginning of class for the warmup) we will break for a short discussion of the material. This will be accompanied by a prompt from me. Discussion partners (random breakout groups) will work together to answer a question, complete a computational exercise, identify misunderstandings, solidify concepts, and/or develop questions about the material.

- All partners should contribute to the discussion; in fact all partners are required to say something!
- Identify any thoughts, ideas, confusions, or new questions generated by the discussion.
- The partnership will formulate a response to the prompt that all partners understand.
- Each partner should be prepared to share the response with the class.

After we return from the breakout group, I will randomly select a student, and that student should explain the partnership's answer to the class. It is not a tag team answer. **Only the person I called should answer the question.** It is ok to say that you and your partners were not sure of an answer, but I will ask a followup question regarding what you and your partners discussed while you were trying to answer the question, so if your group cannot figure out the answer to the question I pose, come up with other questions you would like to ask me, or an explanation of where you got stuck. Participation in these conversations contributes to your engagement grade.

Partnerships

As described above, we will spend part of the class time working in small breakout groups. When working in a partnership it is important to remember that varied backgrounds and experiences naturally induce varied explicit and implicit assumptions and attitudes towards each other. Each student should work diligently to be a cooperative, contributing member of the partnership who is helping the group achieve a common goal. The bottom line is that successful partnerships are founded on mutual respect. This can be achieved by:

- using your partners' names;
- recognizing that all partners matter and actively listening to all other partners;
- graciously inviting all of your partners to offer insights, suggestions, opinions, questions, etc.;
- being courageous enough to offer your own insights, suggestions, opinions, questions, etc.;
- being cognizant of the process by which partnership functions and how you operate within the partnership;
- thanking your partners at the end of each session.

Homework, Quiz, and Exam Submissions and Returns

All homeworks, quizzes, and exams will be submitted and returned on [gradescope.com](https://www.gradescope.com). You will need to scan your homework in **black and white into one .pdf file**. See the "Technology" section below for information.

Workload

The amount of time students spend on this course outside of class varies depending on many factors, but about 12-15 hours a week beyond the online class sessions is quite typical.

Academic Honesty

Make sure you are familiar with the [college's guidelines](#) for academic honesty. There are very serious consequences if you are found to be in violation of one of these policies. I do encourage you to work together to solve homework problems, but everyone must write their own solutions. **Copying solutions from any sources is considered academically dishonest.** If you do so, you are cheating yourselves of the essential practice you need to learn the material. If you are worried about your grade, or if you're frustrated about the material, come talk to me.

If you work with others or get assistance at the Math Lab, note this at the top of the first page of the assignment (or on the specific problem(s) you got help with) . This is purely for bookkeeping purposes and will not affect your score whatsoever.

Calculators and Computers

Calculators will not be required in this class. You will likely find great value in using graphical aids to help you learn the material in this course. Computer programs such as *Maple* and *Mathematica* are available to students at Grinnell and more information is available on PWeb ("Computer Programs" tab). The program *Sage* www.sagemath.org (a Python-based program) is a free program, available either to work online or to download. I will use *Maple* in class.

Getting Help

- The Math Lab (Mathematics Learning Center) has wonderful tutors available many hours during the week and on Sundays. Their web page is [here](#) (login required) or see the "MathLab Info" tab on PWeb.
- Come to my office hours with questions about material, assignments, or general questions about the course or your grade. These are times during my day I specifically set aside to be available to answer questions. I'm also happy to schedule an appointment to talk with you.
- Work together with others.
- Other resources, like YouTube videos and other class notes are available on PWeb under "Videos and Other Notes". If you find useful material or videos, please share them with your classmates on Piazza.

Grinnell College makes reasonable accommodations for students with documented disabilities. Students need to provide documentation to the coordinator for student disability resources, Jae Hirshman. Student should then notify me within the first few days of classes so that we can discuss ways to ensure your full participation in the course and coordinate your accommodations.

Success in my Classes

Students come to this class with very different backgrounds, skills, and experiences. Usually the most successful students in my class have two things in common: they work hard, and they are able to self reflect honestly and then make adjustments accordingly.

My job is to help you *all* learn multivariable calculus. I do not think any less of you if you struggle with the material, or if you come ask me for help in office hours. In fact, I view struggling and discomfort with material as an essential part of learning! If you are frustrated or overwhelmed with the course, email me and we'll set up a time to talk.

Technology

I will be regularly checking email 7:00 AM -9:00 PM Grinnell time on weekdays and a bit on the weekend. Don't hesitate to email me with questions or issues you run into. There are several basic types of technology you will need for the class.

ZOOM

We will use Zoom for class meetings and my office hours. Make sure you put your name when you log in so I know who you are. There is an app for desktops and phones/tablets which I recommend you download. The URL for our class meetings are posted on PWeb. You are not absolutely required to have audio or video on but if you can have your video on, please do so. There is a chat window so you can type questions if you don't have audio. If you do have audio on your device, please wear headphones if possible to avoid feedback.

A note on recordings. There are screen record options with Zoom. I don't generally plan to use it, but there could be occasions where I start talking about something and decide it is worth recording my explanation. I will do my best to let you know the session is being recorded if that happens.

GRADESCOPE

Gradescope will be where you submit your Problem Sets to be graded. It is a new system for me (and Grinnell) and so we may have a few small hiccups with setup at the very beginning. You will submit your problem sets, and the graders will be able to grade the assignments right on there. The ability to upload a rubric allows for consistency in grading, and the online system allows for quicker turnaround time. Here are a few of their help videos.

[Submitting Homework](#)

[Submitting Quizzes](#)

[Viewing Feedback](#)

[Scanning Instructions](#) (I give other methods to scan below. Either way is fine.)

PIAZZA ON BLACKBOARD

On the class PWeb page, there is a link for "Class Discussion". This leads to a page for *Piazza*, a program for asking and answering questions. This is a great place to post questions you have that other students may be able to answer, or resources you found online that helped you understand a concept in the class. Posts on Piazza count positively toward your engagement grade.

SCANNING

You will have to scan your homeworks, quizzes, and exams as a pdf and submit them on Gradescope or PWeb.

If you have an iPhone or iPad you can scan using the "Notes" app. Click on "Notes", open a new note, click on the camera icon at the bottom. Then click "Scan Documents", make sure you are on "Black and White" option at the top, and hit the white button. You will then get a box you can move around to crop the picture to the right size. If you're happy with it, save it and then take the next page. When you're done, you can click on the "Share" button and email it to yourself, or Air Drop or however you want to share it.

If you have an android phone, there is an app called "CamScanner" which has been recommended by several students. You should be able to use the free version and not have to pay for a subscription: <https://tinyurl.com/quwbfhr>. **Don't forget, black and white, pdf format, and one document for the whole assignment.**

A WEB WHITEBOARD

If you would like a shared whiteboard to work with other students (or during our office hours) check out <https://awwapp.com>.

BLACKBOARD COLLABORATE

From PWeb, you will see a link for "Collaborate". Any of you can create Collaborate sessions too from our PWeb page, so you can meet up to work together on homework there if you would like.

Unsolicited Advice

- Take ownership of your education.
- Embrace the discomfort.
- Your final grade in this course will reflect your performance throughout the whole semester. There will be no extra credit and you cannot retake an exam nor redo homework.
- Exam problems will not necessarily be exactly like the homework problems. Understanding *why* we solve a problem in a certain way will result in a better grade than simply trying to mimic examples we have done previously.
- Think of math a bit like learning how to bowl. You can have someone explain to you how to throw the ball and how to put spin on it to make it hit the pins but chances are the first time you throw the bowling ball, you will throw a gutter ball. How do you improve at bowling? You practice. The same is true in math. The best way to learn math is to **practice, practice, practice**.
- Read ahead in the material. A list of pages to read before each class will be regularly updated on the class webpage.
- I can't say it enough, work together when you can.
- If you are struggling, make an appointment to talk with me.

Occasional Classroom Visitors

One of the upsides of teaching from home is more time with pets. Of course, this means the pets show up in class from time to time. In order of likelihood that you will see them, here are our cats (named after mathematicians, of course).



Sylvester is the newest member of the family, and the most likely to make appearances in class. He is an energetic 2.5 year old, and he views anything on my desk as something to play with. [Sylvester](#) the mathematician (1814-1897) worked on many different areas in mathematics.

Tycho(noff) is our current "middle child" and he is 3.5 years old. In the fall, he regularly slept through my classes on the chair behind me. Tycho is named after both the mathematician [Tychonoff](#) (1906-1993) who made major contributions to an area of math called topology, and the astronomer [Tycho Brahe](#) (1546-1601).



Maschke is our most senior cat at 12 years old. She is not thrilled to have two younger brothers, but she copes by pretending they don't exist. She is often in my office in the mornings, but almost always offscreen on a beanbag chair that is likely older than you. She is named for mathematician [Maschke](#) (1853-1908) whose most famous work is a result in a field of math called representation theory.