

Math 232 (Multivariable Calculus)
Section 01, Spring 2019
Hobart and William Smith Colleges
(Lecture) MWF 10:10-11:05 a.m., Gulick Hall 2001

Welcome to Math 232! Multivariable calculus offers some of the most beautiful and useful ideas ever discovered, so I hope you are looking forward to exploring them together. Before we get to the good stuff, though, please take a few minutes to read about how the class is set up. (I reserve the right to update our organization as the semester proceeds, but any changes will be designed to benefit the class. I will let you know of any modifications in advance.)

Instructor: Dr. William Simmons, Lansing 309, wsimmons@hws.edu

Office Hours (held in my office, Lansing 309; overflow will be next door in Lansing 310): M 11:15 a.m.-12:15 p.m., T 10:15-11:15 a.m., W: 3:30-4:30 p.m., F 1:30 p.m.-2:30 p.m.

Please do your best to attend the regularly scheduled office hours, but I am available, time permitting, for additional meetings by appointment. Schedule appointments at least a day in advance; also quickly say what you'd like to talk about (if there are multiple people who want to go over the same subject, we can try to combine). Appointments are 15 minutes or so per slot; let me know if you anticipate needing more time. Please note that I will not generally be available on Thursdays or during lecture and lab hours for my Math 100 class (MWF 8:00-8:55 a.m. and T 8:45-10:10 a.m.).

I will bring a sign-up sheet each day to class for additional appointments. I will indicate times that don't work for me, so check the sheet regularly to make sure nothing has come up. *If you are unable to attend class the day before you would like to meet, feel free to email me, but otherwise please use the sign-up sheet to make appointments.*

Canvas: We will use the Canvas system (<https://canvas.hws.edu>) as our homepage. Look there for assignments, announcements, and grades. Be sure to check the announcements regularly for assignment due dates and other information. (It is helpful to receive automatic email notifications from Canvas about such things.)

Textbook: Calculus: Multivariable, 6th edition, by Hughes-Hallett, Gleason, McCallum (Publisher: Wiley). *Note: If you decide to use a different edition, make sure to check with a classmate that you have the correct problems for each homework assignment; numbers or content may change slightly.*

HWS Educational Goals: Math 232 counts Substantially toward the HWS Educational Goal of Quantitative Reasoning.

Exam and other important dates:

- Add/drop deadline: M, Jan. 28
- First midterm: W, Feb. 20, in class

- Second midterm: W, Mar. 27, in class
- Third midterm: W, Apr. 24, in class
- Last day of class: M, May 6
- Reading days: TWTh, May 7-9
- Final exam: F, May 10, 8:30-11:30 a.m., location TBA

Class structure

My top goals are to help you understand the ideas of multivariable calculus and confidently work your way through problems using the tools you've studied. The following activities are designed to make this a reality:

Lecture and attendance: You'll have reading assignments beforehand to get a taste of what we're discussing that day. You're not supposed to understand everything before class, just figure out what you *don't* understand and think of questions that will help you figure it out. Ask as many questions as possible, even if you think you're the only one who needs clarification on something (you won't be!).

Because asking questions, seeing examples, and contributing your insights are so important, it is critical that you attend all class meetings. I will periodically take attendance, which counts for 5% of your course grade. Please let me know beforehand if you must miss class due to extenuating circumstances. To allow for legitimate things like sick days, sports team travel, interviews, etc., two absences will be dropped.

Written homework and quizzes: Solving problems is the single most important thing you'll do in the course. You will have an assignment each week, which is generally due on Wednesdays. In particular, your first assignment is due W, Jan. 30, at the beginning of class.

I will grade submitted homework on completion, including showing adequate work for each problem. Write neatly and show all relevant work needed to understand your thought process. Incomprehensible and/or messy answers may not receive credit. The emphasis is on clear written explanations as well as explicit calculations. Be sure to use complete sentences and correct grammar in your work. There are no make-ups, but the lowest three scores will be dropped. Homework counts for 10% of your grade.

On the day the homework is due, there will be an in-class quiz (15-20 minutes, about two questions). The problems will come from the homework and examples from class. They might be slightly modified (different numbers or wording) but they will essentially be things you have seen and have answers to. The first quiz will also be on W, Jan. 30, at the beginning of class.

Unlike for midterms and the final, you may NOT use a formula sheet for quizzes. It's important for your problem-solving ability to have the key definitions, theorems, and formulas at the forefront of your mind. Since quizzes cover less material and count less toward your grade than exams, this is a low-stakes place to practice this. The only electronic devices allowed are non-graphing calculators that will be provided. I will also give you scratch paper.

Your lowest three quiz scores will be dropped but there are no make-ups. As usual, please talk to me ahead of time if you face a legitimate extenuating circumstance. Quizzes count for 15% of your grade.

Exams: There are three midterm exams (see the dates above), all held in class. Unlike on the quizzes, you may use one handwritten 8.5×11 formula sheet (both sides) but no outside electronic devices or other notes. I will give you a non-graphing calculator and scratch paper. There will be roughly five questions per exam. I will typically assign some review problems before the exam to help you prepare. Exams are cumulative but will focus on what we have covered since the last midterm. On exam days, please spread out and make as much room as possible between test-takers. As with quizzes, problems will come from class examples and homework (possibly with slight modifications). There are no make-ups, but the lowest exam will be dropped. Midterms count for 40% of your grade.

Final exam: The rules for the final are the same as for the midterms: you may use a handwritten 8.5×11 formula sheet (both sides) and I will give you a non-graphing calculator and scratch paper. There will be roughly ten questions, some on earlier material and some on topics covered since the last midterm. I will assign some review problems before the exam to help you prepare. As with other quizzes and exams, the problems will be versions of class examples and homework problems. The final counts for 30% of your grade.

Extra credit: There are two opportunities for extra credit:

1. Attending office hours: you should attend as often as needed, but I will give you 1 point toward your midterm exam grade once a month for coming. In particular, you need to
 - a. ask a specific mathematical question or, if you don't have any questions,
 - b. work a relevant problem (that's neither too easy nor assigned for homework) beforehand and come explain the solution.
2. There may (or may not) be several Mathematics and Computer Science Department talks throughout the semester, providing a great opportunity for you to have exposure to mathematical topics outside of calculus, as well as applications and student research. You may earn 1 percentage point toward your final exam grade for each talk you attend (up to 3). Roll will be taken and you should turn in a brief (a third or half-page is usually plenty) but well-written report describing at least one key thing you learned. (A great way to do this is to ask the speaker a question and report on the answer.) The deadline is one week after the talk.

Grading

Grades will be based on the final exam (30%), three midterm exams (40% total; the lowest one is dropped), quizzes (15% total; the lowest three are dropped), homework (10% total; the lowest three are dropped), and attendance (5% total; two absences are dropped). The scale is:

- A: 94-100%
- A-: 90-93%

- B+: 86-89%
- B: 82-85%
- B-: 78-81%
- C+: 74-77%
- C: 70-73%
- C-: 66-69%
- D+: 62-65%
- D: 58-61%
- D-: 54-57%
- F: Below 54%

If necessary, I will adjust the scale at the end of the semester to ensure that at least 1/3 of the the class receives an A or A- and at least 1/3 receives a B+, B, or B-. There are no other curves or adjustments.

Errors in recording and/or grading must be brought up within a week of the assignment being returned. *Grades are determined by the numbers, so please don't request exceptions.*

Tips for success in Math 232:

This is a challenging class. You can do well, but it will require significant effort. Here are some things that will help:

- (Background knowledge) You should be able to carry out basic algebra and trigonometry (including graphing and calculating with polynomial, rational, trig, inverse trig, exponential, and logarithmic functions) without too much difficulty. Also, you should feel comfortable with very basic geometry (rectangles, triangles, circles, lines, cones, and spheres) and basic calculus (differentiation and integration of standard functions using substitution and integration by parts). Some rust on topics you understood well in the past can be worked through, but if you have serious difficulties with these tools or never really mastered them, we should talk about options to help you. In addition, you need to be curious about mathematics and be willing to think through the material we discuss.
- (Studying and learning)
 - Be consistent in your studying and keep up with lectures and homework.
 - Study beforehand the material we will work on in class (enough to know what you do and don't understand so you can focus on the problem areas).

- During class I’ll do my best to explain the key points and work lots of good examples. For your part, think actively and try to anticipate the next step (when you’re not sure or the result is different from what you were expecting, that’s a great time to ask a question). *Take notes, but don’t transcribe so much that you’re not able to participate in the discussion.* A good strategy is to just write the highlights, jotting down main ideas, tricky spots, and final answers so that you can reconstruct the discussion and routine calculations when you study your notes later.
 - Practice the art of reading math. Look first for a big-picture understanding and then dig into the details. Work to understand concepts at multiple levels: memorable summary/description, visually, computationally, logically, knowing the definitions by heart, etc. Break each section into a few specific concepts and make it your goal to master them.
 - When you study a new concept, explain it to yourself in terms you understand and make connections with things you have already learned. Think deeply about the material over an extended period of time (i.e., not just before exams).
 - Take a few minutes to think about your strategy for the course: e.g., how much time per day/week and in what activities you plan to invest it (studying the book and other materials, working on homework assignments, etc.), your plan for getting help as needed, preparation for exams, and so on. Beyond this, pick a few big-picture goals that you want to focus on this semester. For instance, you may want to strengthen your skills at translating written descriptions and “word problems” into concrete steps and calculations. Another goal could be learning to extract more understanding from our text. Make it specific to your personal needs and style.
- (Academic integrity) Do your best and don’t compromise your integrity or your academic progress by cheating. You are welcome (and encouraged) to study together, talk about problems with others, look at math resources online, etc., but you need to write up your work on your own and let others do the same. Infractions will result in loss of credit for the exam, assignment, or course and, depending on the situation, administrative discipline. See the Colleges’ Principle of Academic Integrity <http://www.hws.edu/academics/advising/policies.aspx>.
 - (Getting help)
 - When you encounter concepts that aren’t clear, identify what you are confused about and ask me and each other *lots of questions* until you understand. I am excited to talk with you!
 - Come regularly to office hours.
 - Use a variety of sources to find explanations that “click”. Helpful videos on calculus topics are, e.g.,
 - * MIT OpenCourseWare: <https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus/index.htm>,
 - * Khan Academy: <https://www.khanacademy.org/math/multivariable-calculus>, and
 - * Professor Leonard: <https://www.youtube.com/playlist?list=PLDesaqWTN6ESk16YRmzuJ8f6>

Also, check out the excellent examples and notes at Paul's Online Math Notes <http://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx> and Harvey Mudd math tutorials <https://www.math.hmc.edu/calculus/tutorials/>.

- (Technology) The right software can speed up your understanding, help you make guesses, and allow you to check your work. There are many good options, but two free systems that I really like are Math3d (<https://www.math3d.org/>) and GeoGebra (www.geogebra.org).

We will use mathematical software as appropriate to explore examples in class. I encourage you to do the same. Be careful, though, to try problems by yourself *before* consulting computer graphs or computations, especially if the problem concerns graphing. You want to increase your understanding, not diminish it by non-critically accepting results from a device (which will often be wrong or misleading if you're entering commands on autopilot). Remember that you will only have a basic non-graphing calculator for quizzes and exams, so you can't afford to become dependent on outside programs.

- (CTL) Take full advantage of the Center for Teaching and Learning (CTL; website: <http://www.hws.edu/academics/ctl/index.aspx>) located at Rosensweig Learning Commons in the library. They offer resources to help students achieve academic success, including Teaching Fellows (for course content help in some departments), Writing Colleagues (for help on papers), Study Mentors (for help with study skills and time management), Group Study Tables (for content help in specific courses), and more.

Also through the CTL: if you have a disability for which you may need accommodation, you should self-identify and register for services with the Coordinator of Disability Services, Christen Davis, at cdavis@hws.edu or by phone at (315) 781-3359. Disability-related accommodations and services generally will not be provided until the registration and documentation process is complete. The guidelines for documenting disabilities can be found at the following website: http://www.hws.edu/academics/ctl/disability_services.aspx.

- (Other accommodations) Please talk to me as soon as possible about scheduling conflicts with religious holidays, athletic events, etc., or working around health issues and other situations.

Above all, let me know in advance if you have questions or concerns. Best of luck for a great semester!