

Math 130 (a.k.a. Calculus I), Section 1
Fall 2018

MWF 8:00-8:55 a.m., Gulick Hall 2001, (Lab) Th 1:30-2:55 p.m., Gulick Hall 2000
Hobart and William Smith Colleges

Welcome to Math 130! 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 2:30-3:30 p.m., W 10:15-11:15 a.m., Th 12:15-1:15 p.m., F 11:30 a.m.-12:30 p.m.; others, time permitting, by appointment.

Please contact me at least a day in advance for additional appointments; 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; if you want to discuss grades or otherwise talk one-on-one we can do that, too). Appointments last up to 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 Tuesdays or during lecture and lab hours for my other section of Math 130 (MWF 9:05-10 a.m. and Th 3:05-4:30 p.m.).

Math Intern: Andrew (Drew) Scammell, scammell@hws.edu; office hours (held in Lansing 310; same place and time as previous semesters): Sunday 4:00-6:00 p.m., 7-10:00 p.m.; Monday-Thursday 3:00-6:00 p.m., 7:00pm-10:00 p.m.

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: Single Variable Calculus, Early Transcendentals, Second Edition, by Briggs, Cochran and Gillett (Pearson). *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.* There will be at least one copy on reserve for short-term use at the library (<https://libanswers.hws.edu/faq/146607>).

HWS Educational Goals: Math 130 counts Substantially toward the HWS Aspirational Goal of Quantitative Reasoning.

Exam and other important dates:

- Add/drop deadline: Friday, Aug. 31

- First midterm: Friday, Sept. 21, in class
- Second midterm: Friday, Oct. 19, in class
- Third midterm: Friday, Nov. 16, in class
- Last day of class: Monday, Dec. 10
- Reading days: Wednesday-Friday, Dec. 12-14
- Final exam: Sunday, Dec. 16, 7-10 p.m., location TBA

Class structure

My top goals are to help you understand the ideas of differential calculus (chapters 1-4 form the core of the course), be able to explain them to others, and confidently work your way through problems using the tools you've studied. The following activities are designed to make this a reality:

Lecture: 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!).

I'll do my best to explain the key points and work lots of good examples. For your part, think actively during class 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.

Because asking questions, seeing examples, and contributing your insights are so important, it is critical that you attend all lecture and lab meetings. I will periodically take attendance, which counts for 5% of your course grade. Please let me know beforehand if you must miss class or lab due to extenuating circumstances.

Written homework: Solving problems is the single most important thing you'll do in the course. You will have an assignment after most lectures, generally due at the next class. (In particular, your first assignment is due W, August 29, at the beginning of class. There is also a special planning/getting-to-know-you assignment due any time before 5 p.m. on Friday, Sept. 7. See Canvas for all assignments.) Your lowest three scores will be dropped, but late homework will not be accepted; just turn in what you have. (Please talk to me ahead of time if you face a legitimate extenuating circumstance.) You are welcome to study together and discuss problems, *but you need to write up final solutions on your own.*

Format for homework:

- (Goals for mastery) To take on a meaty subject like mathematics, it's essential to identify core topics that you want to master and set goals for yourself. For each chapter and section,

I will ask you to look ahead at the material we will study and get an idea of what seems most important and/or challenging. For instance, Ch. 1 (which we will cover more quickly than the other chapters) is essentially review of the central functions used in calculus. For instance, you may decide that you are comfortable with polynomials and rational functions (i.e., fractions of polynomials), but need to get stronger with logarithms and inverse trig functions. Later on (Section 4.9), you may set a goal to really understand what the antiderivative of a function is, what it means for the antiderivative to be unique “up to an added constant”, and why that is true.

On each homework assignment, you will begin by listing your thoughtfully-chosen goals/focus topics as well as concrete plans for achieving them. (The first assignment will give more detail on how to do this.) Examples are: doing an extra odd-numbered problem on the topic that looks interesting and checking the solution, asking about it in class or office hours, finding extra information in another book or in an online video, etc. At the end of the assignment, you will briefly describe your progress on this section’s as well as on-going goals.

For the planning/getting-to-know-you assignment mentioned above, you will sign up in class for a time to come to office hours or a separate appointment so we can meet and briefly discuss your plan for the semester. (I’ll remind you on Canvas about the assignment; you just need to get it done by 5 p.m. on Friday, Sept. 7.) We’ll shoot for 2-3 people in a slot lasting 5-10 minutes. You will bring the following written information:

1. a short “math bio” describing your last math class, how it went (including course grade), score on the math placement test (if applicable), year in school, and major plans.
 2. A brief-but-thoughtful strategy for the class: 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 technical books like our text. Think about it and make it specific to your personal needs and style.
 3. Any questions, concerns, or hopes you have for the class.
- (Preliminary Work and Solutions) Writing the final solution is only one (and often not the most crucial) step in mastering a problem. The exploratory stage, where you are uncertain about how to proceed or have some obstacle that you haven’t resolved yet, is where you learn the most. Here math is at its most creative: draw pictures, make guesses, look at special cases, do calculations, and so on. While this pretty free-wheeling, it is helpful to add a little structure by keeping track of ideas you have, noting what you have tried, jotting down thoughts and insights that come up. When the inspiration comes and you see what to do, identify what was the key that helped you over the obstacles posed by the problem (e.g., realized that such-and-such a trig identity would be helpful or that some theorem applied, made a picture, etc.).

Both for your benefit and so I can see how you were thinking on the way to finding a solution, please present your work on a problem in two parts, clearly labeled: (a) Preliminary Work and (b) Solution. The Preliminary Work should be legible, but doesn’t require complete sentences or linear structure; just follow the guidelines given above for documenting your

problem-solving experience. In contrast, the Solution should be polished, using complete sentences wherever explanation is called for (e.g., for a conceptual problem or a tricky step in a calculation) and efficiently proceeding from the given information to the answer(s). I will give you an example of the format.

Some exercises are simple and straightforward; you just *do* them without passing through an uncertain stage. In this case, you may simply write “Immediate” under the Preliminary Work section for the problem.

- Lastly, remember to make all submitted work clean and easy to read and follow.

Labs: On Thursdays we’ll work together on more involved problems. As usual, there will be a reading or prep assignment of some kind to help you prepare. You’ll typically work in pairs (assigned randomly), but exactly how you go about tackling different problems is up to you. Some partners may prefer to talk through everything while others may want to divide and conquer, thinking about things on their own and then sharing insights. (Often, though, as part of lab I will ask you to review a topic by explaining it to your partner; this part of the assignment is necessarily interactive.) *However you do it, you’ll need to write up your own individual solutions and be responsible for understanding each piece of the problem.* Solutions will generally form part of the written homework due the following Monday. Labs contribute to your homework grade (see the grading section below); attendance is also taken since you need to be there to work with your assigned partner. You are expected to stay the entire time; quizzes will be held at the end of lab and there will sometimes be additional problems that qualify for extra points (see the end of this section for the limited extra credit opportunities you may take advantage of).

Quizzes: Most weeks (except for those with midterms), we will have a short quiz (15 minutes) at the beginning of lab. It will cover recent material (from the previous lecture or two) and be fairly straightforward if you are keeping up. Your lowest two 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. The first quiz is Thursday, Sept. 6.

Unlike for midterms and the final, you may NOT use a cheat 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 much less material and count much less toward your grade than exams, this is a low-stakes place to practice this. Also, the only electronic devices allowed are non-graphing calculators that will be provided for some quizzes. I will also give you scratch paper.

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. Please spread out and make as much room as possible between test-takers.

There are no dropped midterms or make-ups. However, there is a way to get some points back on problems you missed; please read about extra credit at the end of this section.

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.

Extra credit: There are three (and only three) opportunities for extra credit:

1. After each midterm, you may resubmit missed problems. For each problem that you redo, you should give a brief explanation of what went wrong on the original problem (e.g., if you had a conceptual misunderstanding, explain what it was or if you misapplied a rule, give the correct one) and clearly write up a new solution. *You should work on these by yourself.* I will return up to one-third of the points you missed on that problem, but only for solid rewrites that demonstrate you have mastered the material at stake. The deadline for redoing problems is one week after exams are returned.
2. There will 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 course 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.
3. During labs, some pairs of students may complete the day's problems early. From time to time there will be additional optional problems that you may work on for a small number of extra points. However, your focus should be doing the assigned problems well; hurrying through the core problems to get to any extra problems will hurt your score more than it will help.

Grading

Grades will be based on the final exam (35%), three midterm exams (35% total), quizzes (10% total), homework (15% total), and attendance (5% total). 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 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-.

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.*

Keys to success in Math 130:

- (Background knowledge) You should be able to carry out basic algebra (including graphing and calculating with polynomial, rational, trig, exponential, and logarithmic functions) without much difficulty. Also, you should feel comfortable with very basic geometry (essentially just facts about rectangles, triangles, circles, and lines). 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.

We will cover at least Ch. 1-4 of the text. If you did reasonably well with this material (differential calculus) in a previous class and received a strong score on the math placement exam (say, 26 or above), you should consider taking Math 131; please talk to me right away if you have questions.

- (Submitted work) Write neatly, follow the requested format for homework, 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.
- (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 Desmos (www.desmos.com) and GeoGebra (www.geogebra.org); you can use them on a desktop or phone.

We will use mathematical software as appropriate to explore examples in class and lab. I encourage you to do the same. Be careful, though, to work non-technology-dependent problems by yourself *first* 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 at most you will only have a basic non-graphing calculator for quizzes and exams, so you can't afford to become dependent on outside programs.

- (Tips) This is a challenging class. Here are some quick tips:
 - Be consistent in your studying and keep up with lectures and homework.
 - Study beforehand the material we will work on in class and lab (enough to know what you do and don't understand so you can focus on the problem areas). Don't rush over worked examples in the text; make the most of them by attempting them once you have understood what they are asking but before reading the detailed solution. The solution is then a great resource for hints or to confirm your answer. Also, practice the art of reading technical material; 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.

- 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).
- Be organized in taking notes and write just enough to remember the main points but not so much that you can't think as we're discussing. Afterwards, study your in-class notes.
- Please contact me in advance if an issue arises. Also, please read the syllabus and class announcements on Canvas carefully; many questions are already answered there.
- 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>.
- Lastly (but very importantly), when you encounter concepts that aren't clear, identify what you are confused about and ask me, Drew, and each other *lots of questions* until you understand.

- (Getting help)

1. Come regularly to office hours; both Drew and I are excited to talk with you!
2. Use a variety of sources to find explanations that “click”. Helpful videos on calculus topics are, e.g.,

- <https://ocw.mit.edu/courses/mathematics/18-01-single-variable-calculus-fall-2006/video-lectures/lecture-3-derivatives/>,
- <https://press.princeton.edu/video/banner>,
- <https://www.khanacademy.org/math/calculus-home>, and
- <https://www.youtube.com/user/professorleonard57>.

Some good supplementary books are *The Calculus Lifesaver* by Adrian Banner and *The Humongous Book of Calculus Problems* by W. Michael Kelley. Also, check out all the excellent examples and notes at Paul's Online Math Notes <http://tutorial.math.lamar.edu/> and Harvey Mudd math tutorials <https://www.math.hmc.edu/calculus/tutorials/>.

3. 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.

4. (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 if you have questions or concerns. Best of luck for a great semester!