

Math 131 – Calculus 1

Sections 2 and 4 – Fall 2023

Instructor

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Office: 2516 Noyce

Office hours: 10:30am-Noon T/Th

Course meetings

Section 2 – 10:00-11:20am

Noyce 2243

Section 4 – 1:00-2:20pm

Noyce 2517

What is this course? Calculus 1 is about the geometry of functions and their graphs. You will grow in your ability to recognize, sketch, and reason about graphs of functions of many kinds: linear, polynomial, rational, square root, exponential, etc.

In the first half of the course, we study tangent lines, rates of change, and derivatives. In the second half, we study areas, antiderivatives, and integrals. The punchline of the course is that by some miracle, tangent lines and areas are fundamentally connected. This connection is so important that it has a fancy capitalized name: the **Fundamental Theorem of Calculus**.

Course objectives: By the end of the semester, a successful student will be able to

- Sketch common functions (linear, quadratic, root, trigonometric, exponential, logarithm) in the xy -plane and use geometric intuition as a problem-solving tool.
- Compute limits and articulate the connection between limits and continuous functions.
- Use differentiation techniques like the power rule and chain rule to compute derivatives, and articulate the connection between differentiation and rates of change.
- Use basic integration techniques such as the power rule and u -substitution, and articulate the connection between anti-differentiation and area.
- Demonstrate an understanding of the relationship between differentiation and integration by using the Fundamental Theorem of Calculus (primarily to evaluate definite integrals).

Course policies

Format: This course meets three times a week for 80 minutes. Class time will be a mixture of lecture and working in pairs. Do not have a laptop open in class unless you are using it to take or refer to notes. If you use it for other purposes, I may ask you to close it.

Communication: I will communicate via Pioneer Web, Gradescope, and email. Homework assignments will be posted on Pioneer Web and Gradescope. Homework consists of problems from the textbook. The best way to communicate with me is email or conversation after class.

Office hours: Office hours are Tuesdays and Thursdays 10:30am-noon, no appointment necessary. Come for any reason, such as to ask about a difficult homework problem you're struggling with, or an example from class you didn't understand. If my office hours conflict with your schedule, send me an email and we can find another time to meet.

I also have office hours Tuesdays and Thursdays at 1-2pm for another class. You can come by, though I will prioritize students from the other class at that time. I will also hold an informal office hour every Wednesday 4-5pm at Saint's Rest coffee shop in downtown Grinnell. Come by if you want to chat with me in a less academic setting.

Accommodations: If you have a documented disability, I probably already received an accommodation letter, but please come chat with me about it as well. If you have a disability that isn't officially recognized by the college yet, I can help you set up a meeting with Jae Hirschman or Autumn Wilke from the Disability Resources Center.

Absences: Let me know as if you will miss class to observe a religious holiday, play in a college sporting event, etc. so we can plan together how you can still fulfill the requirements of the course.

Textbook: *Calculus (6th Edition)*, James Stewart.

ISBN-13: 978-0-495-01160-6

ISBN-10: 0-495-01160-6

A paper or electronic copy of the textbook is necessary to complete homework assignments. The schedule also includes recommended readings from each textbook section. These readings are just that – a recommendation.

Mindset: Hopefully you're open to the possibility that you can succeed at math, but maybe you (or your classmate) still have anxiety around math. Maybe you've said, "I'm not a math person." However, please know that your math ability is not fixed, though it is hard work to improve. While your primary responsibility in this class is your own learning, you are also partially responsible for your classmates learning, so try to avoid complaining and focus instead on encouraging others.

Academic support and alerts: The academic advising office has many resources for struggling students, and can help connect you with a variety of campus resources. To the best of my abilities, I try to be aware of struggling students, and if I notice you are encountering difficulty, I will communicate with you about it (by email), and may submit an academic alert. An academic alert notifies the academic advising team and your advisor so that they can reach out to you with additional offers of support.

Grades:

		[94, 100]	A
		[90, 94)	A-
Participation	7%	[87, 90)	B+
Sketching journal	7%	[84, 87)	B
Homework	33%	[80, 84)	B-
Quizzes	33%	[77, 80)	C+
Final exam	20%	[70, 77)	C
		[60, 70)	D
		[0, 60)	F

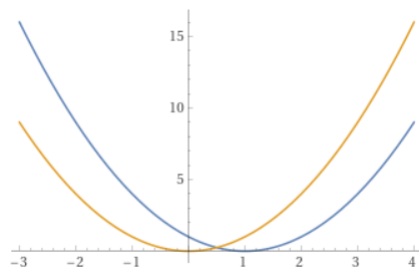
Participation: Based on in-class completion of worksheets. These are graded on completion, not correctness, and cannot be made up if missed. They will happen between a third and half of classes. I will not pass these back; think of them as a proxy for attendance.

Sketching journal: Every class period we will start with a "Sketch of the day" where we will practice sketching function graphs in order to develop this skill. I recommend a separate small notebook, something you can turn in. It should have one entry for each class day, including the date, equations, and a sketch. Below is an example entry. I'll collect these just before fall break to check how you're doing, and the final version is due the final day of class (Friday, December 8).

Example journal entry

Date: Wednesday, August 23

Graph $y = x^2$ and $y = (x - 1)^2$ on the same plot



Homework: Each class period has an associated problem set. You are welcome to work together with classmates, but must write down your own solution.

- Assignments are due on Tuesdays, Thursdays, and Sundays at midnight. Submit on Gradescope.
- Assignments focus on material covered the previous class period, with some mixed in review. For example, Tuesday assignments will focus on material from the previous Monday.
- To make it possible for the graders to do their work, late homework will receive no credit. As compensation, the lowest 3 homework grades will be dropped when calculating the final grade.

Quizzes: There will be a weekly quiz each Friday, taking the last 20 minutes of class.

- Quizzes cover material from the previous Monday, but not Wednesday. For example, the quiz on Friday, September 8 covers material from Monday, September 4 (and earlier), but not material from Wednesday, September 6.
- You will not have a calculator or formula sheet, but may bring a single 3x5 note card.
- Quiz 0 on September 1 is practice; it will not affect grades.
- The lowest two quiz scores will be dropped when calculating the final grade.
- Quizzes 6 and 12 will be double in length (40 minutes), and involve more review topics than other quizzes. For the purpose of grade calculation and dropping quizzes, these will be treated as if they were two quizzes.
- You will not be able to take a quiz after the scheduled date. I know this may seem inflexible, but this is so I can pass out graded quizzes and post the answer key on Monday. I'm unwilling to delay that for everyone else so one person can make up a quiz.

If you will miss a quiz for a college-sanctioned reason such as a sporting event or religious holiday, you can make it up before (ideally Thursday). If you miss for an unexpected reason such as sickness or family tragedy and have documentation, I will drop an additional quiz from your grade. If you miss a quiz for something like a sporting event that was knowable ahead of time and do not make it up before, I will not drop an additional quiz. It is your responsibility in such a situation to make arrangements with me to make it up ahead of the scheduled quiz date.

Final exam: The final exam is on Tuesday, December 12th at 9am (Section 2) or Thursday, December 14th at 2pm (Section 4). You will not be able to use a calculator on the final exam, but like quizzes will be allowed to bring a note card.

Unless you tell me otherwise, I will assume you are taking the final exam with your section. However, if the other time works better for you, just let me know by the last week of class if you plan to switch and take the exam at the other time.

Academic honesty: Make sure you are familiar with the college's academic honesty policy available at https://www.grinnell.edu/sites/default/files/docs/2021-09/2021-22_Academic_Honesty_booklet_accessible_0.pdf. There are very serious consequences if you are found to be in violation of one of these policies. A typical first offense is a zero on the particular assignment and your overall grade drops one letter.

Math lab: The math lab is available for drop in tutoring five days a week. It is located in room 2012 of the Noyce Science Center. For details on its hours, visit the math lab page at <https://grinco.sharepoint.com/sites/MathLab>.

Schedule

Day	Section	Topic	Reading	Quiz
Week 0				
August 25	2.1	Tangent lines		
Week 1				
August 28	2.2	What is a limit?	61-64	
August 30	2.3	Calculating limits	66-68	
September 1	2.5	Continuous functions	97-99	Quiz 0
Week 2				
September 4	3.1	Rates of change, derivatives	112-114	
September 6	3.2	The derivative as a function	123-124, 126	
September 8	3.3	Calculating derivatives using formulas	135-136, 142	Quiz 1
Week 3				
September 11	3.4	Derivatives of trig functions	148-149	
September 13	3.5	The chain rule	155-157	
September 15	3.6	Implicit differentiation	164-166	Quiz 2
Week 4				
September 18	3.7	Applications of derivatives	Pick a topic	
September 20	4.1	Maximums and minimums	205, 208-209	
September 22	4.3	Derivatives and graphs	220-222	Quiz 3
Week 5				
September 25	4.4	Limits at infinity	230-231	
September 27	4.5	Curve sketching	243-245	
September 29	4.7	Optimization	256-258	Quiz 4
Week 6				
October 2	4.9	Antiderivatives	274-276	
October 4	7.1	Inverse functions	385-388	
October 6	7.2	Exponential functions	392-394	Quiz 5
Week 7				
October 9	7.3	Logarithmic functions	405-407	
October 11	7.3/7.4	Derivatives of log functions	411-412	
October 13	7.4	Derivatives of log functions Turn in sketch journal	418-419	Quiz 6 (double)
October 16-20		Fall break		

Week 8				
October 23	5.1	Areas under curves	289-290	
October 25	5.1/5.2	Definite integrals	296-297	
October 27	5.2	More definite integrals	307-309	Quiz 7
Week 9				
October 30	5.3	Fundamental theorem of calculus, part 1	313-315	
November 1	5.3/5.4	Fundamental theorem of calculus, part 2	318-320	
November 3	5.4	Net change theorem	324-325	Quiz 8
Week 10				
November 6	5.5	Evaluating integrals by u -substitution	333-334	
November 8	5.5/6.1	Areas between curves	336-337	
November 10	6.1	Areas between curves	347-349	Quiz 9
Week 11				
November 13	6.2	Solids of revolution	354-356	
November 15	6.2	Volumes using disks and washers	357-359	
November 17	6.3	Volumes using cylindrical shells	365-366	Quiz 10
Week 12				
November 20	6.3	Volumes using cylindrical shells	367-368	
November 22		Thanksgiving break		
November 24		Thanksgiving break		No quiz
Week 13				
November 27	7.2/7.3	Antiderivatives of exp and log	401	
November 29	7.4	Logarithmic differentiation	417-418	
Deember 1	7.5	Exponential growth and decay	447-448	Quiz 11
Week 14				
December 4	7.8	L'Hospital's rule	470-472	
December 6	7.8	L'Hospital's rule	474-475	
December 8		Review		Quiz 12
		Sketch journal due		(double)
Exam week				
December 12	9am-noon	Final exam (Section 2)		
December 14	2-5pm	Final exam (Section 4)		