Math 155: Calculus for Biological Scientists

Fall 2025 Syllabus

1 Course Details

1.1 Course Meetings

MTWF Section 1 08:00 AM - 08:50 AM, ENGRG E 205
MTWF Section 2 2:00 PM 2:00PM - 2:50 PM, Stadium 1214
MTWF Section 3/103 10:00 AM - 10:50 AM, TILT 221
MTWF Section 4 11:00 AM - 11:50 AM, ENGRG E 205
MTWF Section 5 9:00 AM - 9:50 AM, ENGRG E 205
MTWF Section 6 12:00 PM - 12:50 PM, MOLSCI 123
MTWF Section 8 3:00 PM - 3:50 PM, PHYS 243
MTWF Section 9 4:50 PM - 4:50 PM, ENGRG E 205

1.2 Course Instructors

Course Coordinator: Dr. Geoff Krall (geoff.krall@colostate.edu)
Assistant Course Coordinator: TBD
Calculus Center Teaching Assistant: TBD

Section 1: Sarah Chau (sarah.chau@colostate.edu)
Section 2: Rachel Walker (r.h.walker@colostate.edu)
Section 3/103: Dr. Bouhua Chen (Baohua.Chen@colostate.edu)
Section 4: Donovan Leyba (d.leyba@colostate.edu)
Section 5: Lucy Armstrong (lucille.armstrong@colostate.edu)
Section 6: Avalon Blaser (avalon.blaser@colostate.edu)
Section 8: Dr. Geoff Krall (Geoff.Krall@colostate.edu)
Section 9: Brendan Polo (Brendan.Polo@colostate.edu)

1.3 Office Hours

The Calculus Center in the TILT building will be your first place to recieve support outside of class. Rather than instructor-specific office hours, we hold community office hours for all Math 155 students in the Calculus Center[1] (second floor in the TILT building). You can find the office hours calendar on our Canvas course homepage. Generally the Calculus Center has a MATH 155 instructor at all times between 9:00am and 4:00pm. The Calculus Center also has general tutoring hours between 5:00pm and 9:00pm, during which a math tutor will be available. Please feel free to also request appointments if you need to meet outside of these hours.

[1] mathematics.colostate.edu/about/calculus-center

1.4 Communication

E-mail is the best way to contact your instructor outside of class. You can expect a response within 24 hours on weekdays which either answers your question, or to set up a further meeting to discuss your question. You, in turn, are also expected to check your university email and our Canvas course regularly and respond in a timely manner.

1.5 Prerequisites

This course requires prerequisite courses of MATH 124 (Logarithmic and Exponential Functions), and MATH 125 (Numerical Trigonometry) or MATH 127 (Precalculus).

1.6 Textbook

There is no need to purchase a textbook for MATH 155. We will use the free open educational resource, Calculus for Biological Scientists[2]. You can access both HTML and PDF versions of the text from our Canvas course, or on Mountain Scholar [3]. We recommend that you use the HTML version whenever possible for the best experience, and have the text accessible for all class meetings. We care about accessible texts [4], so if you have suggestions based on your experience with this text, please share them!

1.7 Course Website

We will use Canvas[5] for all course material and grades. This is a great place to stay organized and know what is due when.

1.8 Course Ethos

Rougly speaking, mathematics is composed of two essential components:

- creative ideas, and
- effective communication.

In this course, we will work to learn content while valuing both of these components, which means you should expect to ask (and be asked) lots of questions, explain thought processes and ideas through discussion and writing, and be stretched to think about problems you may have not seen before. Not only are these components the essence of mathematics, but they are also skills that will continue to help you succeed after graduation!

We will also acknowledge that making mistakes is a necessary component in learning something new, and that everyone has valuable insights that can help deepen our understanding of a concept.

1.9 Course Structure

Research shows that people learn mathematics best when they are actively engaged in the material with their peers. In other words, you learn by doing and interacting, not by watching. Therefore, our course is not comprised solely of lecture content, but instead provides multiple opportunities for individual and group work in which you will be actively engaged, solving problems, and understanding connections.

You are encouraged to complete Warm-Up activities from our textbook before class. A small time investment can make a big difference! Being exposed to this material before class allows us to dedicate more of our time together to digging deeper, asking and answering questions, and working together to better understand the course content. Class time is intended to deepen and extend aspects of the text, not to replace it.

[2] https://jshriner6.github.io/bio-calc1/root-1-2.html
[3] mountainscholar.org/handle/10217/235552
[4] www.chhs.colostate.edu/accessibility/
[5] canvas.colostate.edu

1.10 Course Content

The first semester of calculus for biological scientists develops elementary functions and dynamical systems as tools for modeling biological systems. The class develops the concepts of limits, differentation, and integration of functions of a single variable, and uses them to analyze the behavior of systems. Examples include identifying and classifying system behavior around equilibrium points, describing long run behavior of systems, and giving numerical descriptions of system behavior.

1.11 Calculator and Technology

You should have access to technology that can graph functions to explore ideas inside and outside of class. Examples of such technology include a calculator such as a TI-83 or better, a graphing calculator application for a smartphone, and web sites such as Wolfram Alpha[6] and Desmos[7] Desmos is used for interactives within the course text and will be used heavily for illustrations and class activities, so we recommend making this your primary technological tool for the course.

2 Grades

2.1 A Note On Academic Integrity

We learn best together, which is why there is a large amount of collaboration built into our course structure. However, there is a difference between learning together and using someone else's work. If you are wondering if you crossed the line, ask yourself "Could I start over and redo this on my own, and would it basically look like this?" If not, then you are submitting someone else's work (plagiarism). Copying solutions from the internet also constitutes plagiarism. Because "post-and-solve" resources (such as Chegg.com and Slader.com) do not typically follow our "learn together" philosophy, you should not use these resources to post or view problems from our course. We take academic integrity seriously, so all cases of plagiarized work (including work receiving aid from any "post-and-solve" resources) and cheating will receive a 0 and will be submitted to the SRC.

2.2 Letter Grades

Overall grade percentages will be calculated based on the following weighting:

- Cumulative Final Exam (15%)
- Thursday Midterms (x2) (25%)
- Quizzes (x6) (25%)
- Online Practice (x12)(20%)
- Desmos Labs (x5) (10%)
- Discussion Boards (x6) (5%)

Letter grades will be assigned according to a scale no stricter than the following:

A+	[98,100]
A	[92,98)
A-	[90, 92)
B+	[88,90)
B	[82, 88)
B-	[80,82)
C+	[78, 80)
C	[70,78)
D	[60,70)
F	[0,60)

[6] www.wolframalpha.com
[7] www.desmos.com

3 Assignments and Assessments

The only effective way to learn mathematics is to do mathematics. Besides working on problems in class, you will have assignments and assessments in this course to enhance your skills and understanding. In general, late work is not accepted. Please communicate with your instructor if you have circumstances that will make it difficult to meet a deadline; the outcome is typically better if you communicate an issue before something is due.

3.1 Online Practice (WeBWorK)

You will have weekly online practice assignments on WeBWorK:

https://wuzzy.natsci.colostate.edu/webwork2/FA-MATH-155

Your initial login credentials will be your eID in all lowercase (Username) and your 9-digit student ID (Password). Please change your password after your initial login. If you have issues with logging in, please email Geoff.Krall@colostate.edu.

These are meant to be more procedural questions which test the big ideas from particular sections and give you immediate feedback. They will be due on Wednesdays by 11:59 pm MT. Online practice assignments are an opportunity to make mistakes and learn from them. You can attempt a problem as many times as you would like before the due date. Your instructor will likely not be available for communication the evening of the due date, so please start early and plan to use help resources when they are available!

3.2 Desmos Labs/In-class Participation

Throughout the course, we will have the opportunity to experience the content through interactive activities entitled "Desmos Labs." These labs are designed to allow you to obtain a conceptual grasp on the content through interactive activities. Each lab is accompanied by a physical worksheet to allow for pencil-and-paper work to supplement the Desmos activity. These labs are intended to be completed in person in class. If you have a University excused absence, you may make up these labs in the Calculus Center during tutoring hours. You will be required to obtain a signature from the present instructor/tutor. Make sure you notify and arrange with your instructor.

3.3 Discussion Boards and Participation

The mathematical content covered in this course is important, but the mathematical process behind the content is equally important in your development as a scientist.

Each non-quiz week there will be a short video or reading posted with prompts asking you to reflect on these bigger picture topics in mathematics. In a discussion week, discussion boards will be made available on Monday, and responses are due by 11:59 pm MT Thursday.

3.4 Quizzes

There will be six in-person quizzes bi-weekly on Fridays. The quizzes will be comprised of questions similar to the WeBWorK and Written Exercises in the textbook from the previous week, and will take place during your normal scheduled class time. Each is worth a total of 20 points. Therefore, it is important that you engage with these exercises on time so that you can receive feedback and ask questions to correct any misunderstandings before the quiz. We will drop your two lowest quiz grades at the end of the semester, so you can miss up to two quizzes for any reason and not be penalized in the gradebook.

In addition, you will be allowed to make up half of each quiz grade through supplemental problems. For example, if you obtained a 16/20, you can get an 18/20 through the quiz corrections process. The process for quiz corrections is this:

1. On a separate document, identify the problems you got wrong and the section (§) in the textbook they are from.

2. Redo the problem correctly, showing step-by-step how you arrived at the solution. Include a sentence or two explaining your mistake from the quiz and how you solved it correctly.

3. Complete three supplemental exercises provided by your instructor that relate to that same section.

Complete these tasks within a week of the quiz being graded. Your instructor may have a preference whether you submit the quiz corrections on paper or online.

3.5 Mid Term and Final Exams

There will be three in-person exams: two midterm exams and one final exam. The exams will cover content that you have had the opportunity to practice on WeBWorK, Written Exercises, and Quizzes, and will take place during the scheduled times provided by the registrar. Assessments will be written so that technology is not required. If you would prefer to have a calculator, please bring something that does not have access to the internet.

The exam dates are listed below; please put them in you calendar now, as we are not able to accommodate alternate arrangements.

1. Mid Term 1 Thursday 10/2/2025 5:00-6:50pm Rooms TBD
2. Mid Term 2 Thursday 11/6/2025 5:00-6:50pm Rooms TBD
3. Final Exam 12/17/2025 7:30am-9:30am

The final exam will be cumulative. It will be split into three sections:

- Section 1: Material from the first midterm
- Section 2: Material from the second midterm
- Section 3: New material after the second midterm.

We know that it can take time to learn new concepts. Therefore, if your percentage score in the first two sections of the final exceeds your score in the corresponding midterm, we will replace your midterm score with your section score from the final. For example, if you score a 80% on Midterm 1 but achieve a 90% on Section 1 (Midterm 1 material) of the Final Exam, your Midterm 1 grade would be replaced with 90%. It will not lower your grade if you happen to score lower on that section of the final exam.

Due to the logistical difficulties of administering exams and quizzes with the volume of students in our course, there will be no makeup quizzes and makeup midterms will be administered during the final exam. The only exceptions will be absences documented by University resources, such as the SDC or student case management.

4 Course Calendar (Fall 2025)

The following is a tentative course calendar. Individual topics are subject to change. However, the quiz and exam days are essentially fixed.

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1 (8/25)	Intro to Course 1.1 Biology and Calculus	1.2 Functions	1.2 Functions		MATH 155 Pre-assessment Discussion 1 due
2 (9/1)	Labor Day	1.3 Units and Transforma-tions	1.4 Linear Functions HW1 due		Quiz 1 (1.1-1.2)

Week	Monday	Tuesday	Wednesday	Thursday	Friday
3 (9/8)	1.5 Exponential and Logarithmic Functions	1.6 Trigonometric Functions	1.7 Discrete Time Dynamical Systems HW2 due		Desmos Lab 1 - Functions Discussion 2 due
4 (9/15)	1.8 Analyzing DTDSs	Flex Day	Desmos Lab 2 - DTDS HW3 due		Quiz 2 (1.3-1.7)
5 (9/22)	1.9 Applications of DTDSs	1.9 Applications of DTDSs	2.1 Limits HW4 due		2.2 Derivative of a Function at a Point Discussion 3 due
6 (9/29)	2.3 The Derivative Function	Flex Day	Review for Mid Term 1	Mid Term 1 5:00-6:50pm	No class
7 (10/6)	2.4 The Second Derivative	2.5 Elementary Derivative Rules	2.6 Derivatives of Sine and Cosine HW5 due		2.7 Derivatives of Products and Quotients Discussion 4 due
8 (10/13)	2.8 Derivatives of Compositions	2.9 Derivatives of Inverse Functions	Desmos Lab 3 - Derivatives HW6 due		Quiz 3 (2.1-2.7)
9 (10/20)	3.1 Linear and Quadratic Approxima-tion	3.2 The Stability Theorem	3.3 The Logistic Discrete-Time Dynamical System HW7 due		3.4 Identifying Extreme Values of Functions Discussion 5 due
10 (10/27)	3.5 Optimization	Desmos Lab 4 - Optimization	3.6 L'Hopitals Rule HW8 due		Quiz 4 (2.8-3.4)
11 (11/3)	3.7 Leading Behaviors	Flex Day	Review	Mid Term 2 5:00-6:50pm	No class
12 (11/10)	4.3 Area Under a Curve and Reimann Sums	4.3 Area Under a Curve and Reimann Sums	4.1 Intro to DEs and An-tiderivatives HW9 due		4.1 Intro to DEs and An-tiderivatives Discuss 6 due

Week	Monday	Tuesday	Wednesday	Thursday	Friday
13 (11/17)	4.2 Solving Pure-Time Differential Equations	4.4 The Definite Integral	4.5 The Fundamental Theorem of Calculus HW10 due		Quiz 5 (3.5-4.3)
14 (11/24)	Fall Break				
15 (12/1)	4.5 The Fundamental Theorem of Calculus	4.5 The Fundamental Theorem of Calculus	4.6 Approximation Using Euler's Method HW 11 due		Quiz 6 (4.2, 4.4-4.6)
16 (12/8)	Desmos Lab 5 (DE & Integral)	Review Mid Term 1 Material	Review Mid Term 2 Material HW12 due		Review New Material
Finals Week					

5 Course and University Policies and Standards

5.1 CSU COVID Guidance

For the latest information about the University's COVID resources and information, please visit the CSU COVID-19 site[8].

5.2 Basic Needs Security

Any student who faces challenges securing their food or housing can receive support from the Rams Against Hunger program[9]. Services include a food pantry, a meal-swipe program, pocket pantries, and in-person assistance with navigating federal aid eligibility. The RAH page includes numerous resources as well as county, state and federal programs which are described and linked. Furthermore, please notify the instructor if you are comfortable in doing so.

5.3 Classroom Behavior, Respect for Diversity and Inclusion

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. For more information, see the policies on classroom behavior and the student code at the catalog[10] and at the SRC[11]4.

We acknowledge that many students have had experiences that have left them feeling excluded from the field of mathematics. We also acknowledge that students from minority groups have been disproportionately impacted. We are making this explicit statement because this unfortunate reality is inconsistent

[8] covid.colostate.edu
[9] lsc.colostate.edu/slice/slice-engagement/rams-against-hunger/
[10] catalog.colostate.edu/general-catalog/policies/students-responsibilities
[11] resolutioncenter.colostate.edu/student-conduct-code/

with the truth that you can be successful in mathematics, regardless of your race, ethnicity, gender, or sexual orientation. We are committed to decolonizing mathematics into a field where every student feels supported in accomplishing the hard work necessary to become better problem solvers. We learn more by listening to diverse perspectives, and we hope you will be ready and willing to share yours in this course.

Here are several resources that highlight the past and current contributions to the mathematics community from underrepresented groups:

1. Meet A Mathematician[12]
2. Mathematically Gifted and Black[13]
3. Lathisms[14]
4. Indigenous Mathematicians[15]
5. Spectra[16]
6. Association for Women in Mathematics[17]
7. Mathematicians of the African Diaspora[18]

5.4 Accommodation of Disabilities

If you are a student who will need accommodations in this class due to a disability or chronic health condition, your instructor will need an accommodation letter from the Student Disability Center (SDC) before they are implemented. Please meet with your instructor during office hours or after class to provide the letter and/or to further discuss your needs.

If you do not already have these letters, please contact the SDC as soon as possible to initiate the accommodation process. The SDC is located in room 121 of the TILT building. Contact them at 970-491-6385 or visit the SDC website[19].

5.5 Student Parents/Guardians/Caregivers

We realize that student parents/guardians and caregivers face distinctive challenges in succeeding academically, and we are committed to supporting those of you who are parents to achieve our course's learning outcomes. If you en- counter challenges in meeting course expectations, please contact us as soon as possible. We'll develop a plan together so you can be successful in the course.

5.6 Student Case Management

Student case management[20] is available to help students with extenuating life circumstances and connect them with resources. In some cases, after we dis- cuss your situation, we may request verifiable documentation for class absences from the SCM office if you request considerations for absences or missed course- work.

5.7 Mental Health and Wellness

CSU is a community that cares. You are not alone. CSU Health Network Counseling Services has trained professionals who can help. Your student fees provide access to a wide range of support services. Call Counseling Services at (970) 491-6053, and they will work together with you to find out which services are right for you. Visit counseling services[21] to learn more and mental health resources[22] for additional

[12] sites.google.com/view/meetamathematician/home
[13] mathematicallygiftedandblack.com/
[14] www.lathisms.org/
[15] www.indigenousmathematicians.org/
[16] lgbtmath.org/
[17] awm-math.org/
[18] www.mathad.com/home
[19] disabilitycenter.colostate.edu/
[20] studentcasemanagement.colostate.edu/
[21] health.colostate.edu/about-counseling-services
[22] health.colostate.edu/mental-health-resources/

student mental health and well-being resources. f you are concerned about a friend or peer, use Tell Someone by calling (970) 491-1350 or visiting Tell Someone[23] to share your concerns with a professional who can discreetly connect the distressed individual with the proper resources. Rams Take Care of Rams. Reach out and ask for help if you or someone you know is having a difficult time.

5.8 Religious Observances and Class Attendance

CSU has a legal obligation to accommodate students' absences due to religious observances. For such an accommodation, it is the student's responsibility to complete the Religious Accommodation Request Form at the beginning of each semester and submit the request via the Office of the Vice President for Student Affairs website. The Dean of Students will communicate with the instructor regarding the student's absence and the student is instructed to discuss how best to ensure an accommodation related to class conflicts. For religious observances that cannot reasonably be anticipated at the beginning of the semester, students must follow the procedure above as soon as possible after the course conflict is identified. If a student knows that a particular course or section of the course will have multiple conflicts with his or her religious obligations, the student is advised to locate another course section or defer taking the course to a different semester. In the event of a conflict in regards to this policy, individuals may appeal using established CSU procedures. Instructors are ad- vised to provide reasonable accommodations to ensure compliance with CSU's obligations. See more details regarding attendance policies at the catalog [24]

5.9 Discrimination and Harassment

CSU is committed to providing an environment that respects the dignity and worth of every member of its community. CSU strives to create and maintain a work and study environment that is fair, inclusive, and responsible so that each member of the CSU community is treated with dignity and respect and is rewarded for relevant considerations such as ability and performance. CSU has adopted a comprehensive policy to define the types of conduct that are prohibited and to prevent harm arising from discrimination, harassment, sexual harassment, sexual misconduct, domestic violence, dating violence, stalking, and retaliation. Conduct that is discriminatory or harmful under the policy inhibits the achievement of the stated goals. All students, faculty, staff, and other persons having business with CSU are expected to know and follow this policy.

Details regarding what is involved in bringing a complaint and the procedures for informal and formal resolution are available from the Office of Support and Safety Assessment for student-to-student behavior and the Office of Equal Opportunity for matters involving non-students such as faculty, staff, affiliates, or visitors and matters involving a student and non-student person. See more details at the catalog[25].

5.10 Academic Integrity and the Honor Code

This course will adhere to the CSU Academic Integrity Policy as found in the Colorado State University General Catalog and the Student Conduct Code. At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services. See more details at the catalog[26] and TILT[27].

[23] supportandsafety.colostate.edu/tell-someone/
[24] catalog.colostate.edu/general-catalog/academic-standards/academic-policies/
[25] catalog.colostate.edu/general-catalog/policies/discrimination-harassment/
[26] catalog.colostate.edu/general-catalog/policies/students-responsibilities/#academic-integrity
[27] tilt.colostate.edu/Integrity/Pledge