MATH 160 Calculus For Physical Scientists I

Instructor Information

Course Coordinator: Ms. Hilary Freeman, hilary.tanner.freeman@colostate.edu, (970)491-5308

Instructors:

Section	Time	Building Room	Instructor
1	MTWF8:00a	ENGRG E203	Page Wilson (Page.Wilson@colostate.edu)
3/103	MTWF10:00a	ENGRG B3	Ian Jorquera (Ian.Jorquera@colostate.edu)
4	MTWF11:00a	ENGRG E205	Alice Mehalek (lice.Mehalek@colostate.edu)
5	MTWF12:00p	ENGRG E105	Ross Flaxman (ross.flaxman@colostate.edu)
6	MTWF1:00p	STADM 1207	Hilary Freeman (hilary.tanner.freeman@colostate.edu)
8	MTWF2:00p	ENGRG E 105	Daniel Tedeschi (Daniel.Tedeschi@colostate.edu)
4	MTWF4:00p	ENGRG B101	Joel Barraza Nava (joel.barraza_nava@colostate.edu)

Prerequisites for Course

MATH 124 (Logarithmic and Exponential Functions) with a B or better) AND MATH 126 (Analytic Trigonometry) with a B or better OR MATH 127 Precalculus with a B or better.

Course Description & Objectives

Limits, continuity, differentiation, and integration of trigonometric and transcendental functions with applications.

The course emphasizes a multi-representational approach to calculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. Connections among representations are also emphasized.

Upon the completion of this course, students will be able to:

- Evaluate limits using appropriate analytical, numerical, or graphical techniques.
- Analyze the continuity of functions.
- Apply the definition and techniques of differentiation to find derivatives including derivatives of transcendental functions.
- Analyze functions represented by an equation or a graph using derivatives and limits.
- Create graphs of functions using properties of limits, derivatives, and integrals.
- Apply techniques of integration to find antiderivatives of a function.
- Evaluate definite integrals using Riemann sums, the Fundamental Theorem of Calculus, geometry, and technology.
- Utilize calculus techniques to solve application problems.
- Apply mathematical definitions and construct logical arguments.

Textbook / Course Readings

Active Calculus, https://activecalculus.org/ and specifically Active Calculus and Active Prelude to Calculus

Course Materials & Equipment

Online homework practice will use WeBWorK. Your account login will be your NetID and your initial password will be your CSU ID NUMBER. Please change your password after logging in. Links to WeBWorK and assignments will be in Canvas.

Course activities/makeup lectures will be through Amplify. Follow links on Canvas. You may wish to create an account.

Participation/Behavioral Expectations

Learning, especially calculus, is an iterative, collaborative struggle! Plan time to visit the Calculus Center for additional assistance. Get help early and often! Schedule weekly time to reflect on your learning and mistakes- revising mathematics is a crucial aspect of learning, especially as future content depends on understanding of previous topics. Expect to spend 12-16 hours (outside of class time) each week. Use a calendar, either paper or on your phone/computer, to schedule time to attend class, do the practice problems (WeBWorK/classwork), prepare for quizzes and exams, visit the calculus center, and prepare for reassessments. Learning how to manage a busy schedule is a skill that will pay off later in life!

Start NOW by putting the exam dates in your calendar:

Thursdays 2/12, 3/2 and 4/16 from 5-6:50pm.

Also schedule at least 3 hours each week when you will go to the Calculus Center!!

Success In Calculus

In this course you should expect to ask (and be asked) lots of questions, explain your thought processes and ideas through discussion and writing, and be stretched to think about problems you may have not seen before. Research shows that people learn mathematics best when they are actively engaged in the material with their peers. In other words, doing and interacting, rather than watching, is a more efficient way to learn. Therefore, our course is not comprised solely of lecture content, but instead provides opportunities for individual and group work in which you will be actively engaged, solving problems, making discoveries, and understanding connections.

Success in this class means that you must be responsible for your learning and developing your understanding of calculus. You must be ready to work hard. Frustration and failure are normal, and often a necessary part, of learning. You are not alone in this journey! You must ask for help and utilize the resources made available. Resources include: your classmates, your instructor, the Calculus Center, the textbook, online videos, practice problems and homework, etc.

I have high expectations, but the class is set up so that you can succeed!

Grading Policy

MATH 160 uses Standards Based Grading. This grading system might feel very different from other classes and will take some time to get used to. Some reasons for grading in this way are to shift the emphasis to becoming fluent with content rather than focusing on partial credit and to reduce the stress of missing a question on a quiz or exam. A huge benefit is that unsuccessful attempts can (and should be) reattempted. Drafting and revising is an integral part of doing Mathematics and succeeding in MATH 160.

- To earn a D, complete at least 15 standards and score at least a 60% on WeBWorK and a 60% participation.
- To earn a C, complete at least 17 standards and score at least a 70% on WeBWorK and a 70% participation.
- To earn a B, complete at least 19 standards and score at least a 70% on WeBWorK and a 70% participation.
- To earn an A, complete at least 22 standards and score at least a 70% on WeBWorK and a 70% participation.

A standard is "complete" if you have earned "satisfactory" the required number of times for that standard, usually 1 to 3 times. See the Standards Tracking Document for more details. Use Canvas Grades (especially Learning Mastery View as seen on a desktop web-browser, not a phone or tablet app) to see your progress on standards. You will need to track your grades using the Standards Tracking Document, which is available on Canvas.

Quizzes, exams, and reassessments are opportunities to demonstrate competency of specific standards. Each attempt of a standard will be graded as Satisfactory or Not Yet. Students must get “satisfactory” on a standard 1 to 3 times total before the standard is considered complete. Only completed standards count toward your final grade! Standards marked “Not Yet” must be revised or reassessed for another chance to meet expectations. See the Standards Tracking Document for more details and for a template for tracking your progress.

WEBWORK is an online homework platform. Webwork assignments will be organized by standard. These assignments will give you a place to practice the standards with instantaneous feedback. Use them to prepare for quizzes and exams. If you are going to reassess a standard, you will be required to have a score of approximately 90% on the corresponding Webwork assignment before you can take a new attempt on that standard.

PARTICIPATION will be assigned in class and will be described by your instructor. It may take the form of participating in class discussions and group work, answering exit surveys, doing Amplify lessons, filling out the standards tracking document, or other activities. Committing to actively engaging in class and attending every day will help you be successful in this class.

REASSESSMENTS: Any standards marked "Not Yet" on a **quiz or exam** will have limited reassessment (new attempt) opportunities. You must take advantage of reassessments to be successful in this course. We will discuss the details in class and on Canvas. Be sure to learn how this process works during weeks 2 and 3 of the semester. Any standard attempt graded as "Not Yet" will NOT count toward your final standard count until you successfully reassess.

As a student enrolled in this course, one of your responsibilities is to submit course work by the due dates listed in Canvas. With that said, I take my role as your instructor very seriously, and, in fact, I care about how well you do in this course and that you have a satisfying, rewarding experience. To that end, it is my commitment to you to respond individually to the work you submit in this class and to return your work in a timely manner. Quizzes and exams will be graded soon enough to allow time to do the reassessments. Webwork is graded immediately, although scores do not automatically post to Canvas. (If, however, due to unforeseeable circumstances, the grading of your work takes longer than the times listed here, I will keep you informed of my progress and make every effort to return your work with feedback as soon as I can and adjust revision deadlines as needed.)

*Keep a copy of all work created for the course, including work submitted through Canvas course learning management system.

* Because we are using Standards Based Grading, Canvas is not able to automatically compute your grade, so any averages you see in Canvas will not necessarily be an accurate reflection of your final grade.

COURSE POLICIES (LATE ASSIGNMENTS, MAKE-UP EXAMS, ETC.)

It is my goal that you learn the content in this class. To get the most out of the course, assignments need to be completed on time so that you can take advantage of feedback, correct

any mistakes, improve understanding, and reassess to demonstrate your competence. Unfortunately, we do not have an infinite amount of time to complete this course, so deadlines do apply.

MISSING A QUIZ OR EXAM: These assessments are not graded for points, so instead of counting against your grade, you have simply lost an opportunity to demonstrate competency. There are, however, a finite number of assessment opportunities in the semester so we expect that you make every effort to take advantage of scheduled assessments. If you have a University Approved Event or are ill on the date of a quiz or exam, notify your instructor **prior** to the assessment, or on the day of the assessment to request a make-up assessment. Requests received after the assessment is due may not be considered. Approved make-up assessments must be completed within 1.5 weeks of the original due date.

WEBWORK: Webwork assignments are grouped by standard. Webwork will be assigned weekly and due on Wednesdays. See Canvas for details. Additionally, to unlock a reassessment quiz you may have to revisit a Webwork assignment and get your average above approximately 90%. Do the Webwork early to avoid any chance of a technical malfunction. **Note: If you have a final Webwork score below 70%, the highest grade you can get in the class is a D. If your final Webwork score is below 60%, you will fail the course.** Webwork assignments will reopen each week that a standard is assigned- this can allow you to recover if you miss some problems one week. Do not get in the habit of putting off Webwork, however! It's intended for continual practice as the semester progresses. Cramming at the last possible minute will be a waste of your time and will not help you learn this content at a deep level and be successful in subsequent courses.

UNIVERSITY POLICIES AND RESOURCES:

Colorado State University provides consistent policies relevant to academic courses and resources to support students with various challenges they may encounter. Click the short link (https://col.st/2FA2g) or scan the QR code for up-to-date information:

Week	Monday	Tuesday	Wednesday	Thursday	Friday	
Week 1 Jan 19-23	MLK Day	Tolerance	Tolerance		Limits	
			WW		**M1Q**	
Week 2 Jan 26-30	Limits	One-Sided Limits	Continuity		Continuity	
			WW		**M2Q**	
Week 3 Feb 2-6	Introduction to Counterexamples	Intermediate Value Theorem	Indeterminate Limits		**M3Group Quiz**	
			WW			
Week 4 Feb 9-13	Infinity and Asymptotes	Infinity and Asymptotes	AROC/Review	**Module 4 Exam**	Derivative at a Point	
			WW	**5-6:50pm**		
Week 5 Feb 16-20	Derivative at a Point	Derivative as a Function	Differentiability		Interpreting Derivatives	
			WW		**M5R**	
Week 6 Feb 23-27	Derivatives Graphically	Power and Exponential Shortcuts	Tangent Line Approximation		Derivatives of sine and cosine	
			WW		**M6Q**	
Week 7 Mar 2-6	Second Derivative and Concavity	Product, Quotient Rules	Mean Value Theorem		**M7Group Quiz**	
			WW			
Week 8 Mar 9-13	Curve Sketching	Chain Rule	Derivative practice	**Module 8 Exam**	L'Hopital's Rule	
			WW	**5-6:50pm**		
Mar 16-20	*Spring Recess*	*Spring Recess*	*Spring Recess*	*Spring Recess*	*Spring Recess*	
Week 9 Mar 23-27	Implicit Differentiation	Extrema and Critical Points Graphically	Extrema and Critical Points algbraically		Concavity Graphically	
			WW		**M9R**	
Week 10 Mar30-Apr3	Concavity, Inflection algebraically	First Derivative Test	Second Derivative Test		**M10Q**	
			WW			
Week 11 Apr 6-10	Optimization	Optimization	Applied Optimization		**M11Group Quiz**	
			WW			
Week 12 Apr 13-17	Applied Optimization	Total Change	Riemann Sums	**Module 12 Exam**	Definite Integral Geometry	
			WW	**5-6:50pm**		
Week 13 Apr 20-24	Properties of Definite Integrals	Fundamental Theorem of Calculus I	Antiderivative Shortcuts		Substitution	
			WW		**M13R**	
Week 14 Apr27-May1	Substitution	Substitution	Accumulation Functions		**M14Q**	
			WW			
Week 15 May 4-8	Fundamental Theorem of Calculus II	Differential Equations	Areas between curves		**M15Q**	
			M15R		**WW**	
Week 16 May 11-15	**Final Reassessment: 7:30am-9:30am**					

Math 160 Grade Tracking Spring 2026

Standards	Chance #1	Earned S on Chance #1?	Chance #2	Earned S on Chance #2?	Chance #3	Earned S on Chance #3?	Chance #4	Earned S on Chance #4?	Reassessment	Ss needed to complete standard	Is the number of checks >= Ss needed?
S1	Mod 3Q	☐	Mod 4E	☐	Mod 7Q	☐	Mod 12E	☐	☐	3	
S2	Mod 3Q	☐	Mod 4E	☐	Mod 10Q	☐			☐	3	
S3	Mod 6Q	☐	Mod 8E	☐					☐	2	
S4	Mod 11Q	☐	Mod 12E	☐					☐	2	
S5	Mod 15Q	☐							☐	1	
L1	Mod 1Q	☐	Mod 2Q(R)	☐	Mod 4E	☐			☐	2	
L2	Mod 2Q	☐	Mod 4E	☐					☐	2	
L3	Mod 2Q	☐	Mod 4E	☐					☐	2	
L4	Mod 4E	☐	Mod 6Q	☐					☐	1	
D1	Mod 6Q	☐	Mod 8E	☐					☐	1	
D2	Mod 6Q	☐	Mod 8E	☐					☐	1	
D3	Mod 7Q	☐	Mod 8E	☐	Mod 10Q	☐			☐	3	
D4	Mod 6Q	☐	Mod 8E	☐					☐	2	
D5	Mod 8E	☐	Mod 12E	☐					☐	2	
D6	Mod 8E	☐	Mod 12E	☐					☐	2	
D7	Mod 10Q	☐	Mod 12E	☐					☐	2	
D8	Mod 10Q	☐	Mod 11Q	☐	Mod 12E	☐			☐	3	
I1	Mod 12E	☐	Mod 14Q	☐					☐	2	
I2	Mod 14Q	☐	Mod 15Q	☐					☐	1	
I3	Mod 14Q	☐	Mod 15Q	☐					☐	2	
I4	Mod 14Q	☐	Mod 15Q	☐					☐	2	
I5	Mod 14Q	☐	Mod 15Q	☐					☐	2	
I6	Mod 15Q	☐							☐	1	

Goal:

Grade	Standards
A	22 or 23
B	19, 20 or 21
C	17 or 18
D	15 or 16

S1: I can generate and use a counterexample to argue that a statement is false.

S2: I can identify limits in indeterminate forms and use appropriate strategies to evaluate the limit.

S3: I can use the limit definition of the derivative to determine the differentiability of a function at a point.

S4: I can use derivatives to solve applied optimization problems.

S5: I can analyze the accumulation function numerically and graphically and compute its derivative.

L1: I can determine input tolerance (delta) from a given function and output tolerance (epsilon).

L2: I can evaluate limits numerically, graphically, and algebraically.

L3: I can determine the points at which a function is (and is not) continuous both graphically and algebraically.

L4: I can compute average rates of change and find slopes of secant lines.

D1: I can interpret the meaning of a derivative in context.

D2: I can find the equation of the line tangent to a function at a point and use this line as a linear approximation to estimate the value of a function at nearby points.

D3: I can describe the relationships between f, f' and f'' and use that information to sketch graphs and list intervals of increase/decrease and concavity.

D4: I can compute derivatives for sums, constant multiples, and power, polynomial, trig, exponential, and logarithmic functions using shortcuts.

D5: I can compute derivatives using the product, quotient, and chain rules.

D6: I can compute derivatives using multiple rules in combination.

D7: I can compute derivatives of implicitly defined functions.

D8: I can use calculus and derivative tests to find extreme values and classify them as maxima or minima.

I1: Given a non-constant rate of change, I can estimate the total change over a time interval using a Riemann sum.

I2: I can interpret the meaning of an integral in context and recognize when an integral would be suitable to model a real-life situation.

I3: I can evaluate a definite integral exactly using geometry or the FToC.

I4: I can use shortcuts to compute antiderivatives for sums, constant multiples, and power, polynomial, trig, exponential functions and 1/x.

I5: I can evaluate integrals using the substitution method.

I6: I can use integrals and antiderivatives to solve differential equations and initial value problems.

Assessment Schedule

Standards	Mod1Q	Mod2Q	Mod3Q	Mod4E	Mod5R	Mod6Q	Mod7Q	Mod8E	Mod9R	Mod10Q	Mod11Q	Mod12E	Mod13R	Mod14Q	Mod15Q	Mod15R	FinalR
S1			Mod3Q	Mod4E			Mod7Q					Mod12E					
S2			Mod3Q	Mod4E						Mod10Q							
S3						Mod6Q	Mod7Q	Mod8E									
S4											Mod11Q	Mod12E					
S5															Mod15Q		
L1	Mod1Q	Mod2Q		Mod4E													
L2		Mod2Q		Mod4E													
L3		Mod2Q		Mod4E													
L4				Mod4E		Mod6Q											
D1						Mod6Q		Mod8E									
D2						Mod6Q		Mod8E									
D3							Mod7Q	Mod8E		Mod10Q							
D4						Mod6Q		Mod8E									
D5								Mod8E				Mod12E					
D6								Mod8E				Mod12E					
D7										Mod10Q		Mod12E					
D8										Mod10Q	Mod11Q	Mod12E					
I1												Mod12E		Mod14Q			
I2														Mod14Q	Mod15Q		
I3														Mod14Q	Mod15Q		
I4														Mod14Q	Mod15Q		
I5														Mod14Q	Mod15Q		
I6															Mod15Q		

Choose up to 3 standards that are not crossed out on each reassessment.
For the Final Reassessment, choose up to 4 or 5 standards that were not on Mod 15 Quiz, plus any of the standards that were on the Module 15 quiz.