

Instructor:

Dr. Chris Lee
Trexler 270D
clee@roanoke.edu

Office Hours:

Office hours are available Monday – Thursday and are by appointment. To make an appointment, please use the link:

<https://drchrislee.youcanbook.me>

Overarching Philosophy: Your ability to do Mathematics is not measured by a number stamped on your forehead at birth. Ability is a direct result of effort, and everything in this course is designed to encourage and reward maximum effort. No matter what your ability or grade is at any given moment, it can be changed through focused effort.

Course Description: This course provides an introduction to Calculus, including the study of limits, derivatives, graphing, and beginning integration. A focus of the course will be the use of technology as a tool and learning aid.

Intended Learning Outcomes: By the end of this course, students will be able to:

- apply techniques of differentiation and integration to model and solve problems.
- understand the role of Calculus and the infinitesimal in modern mathematics.
- understand the concepts behind limits, derivatives, and integrals.
- recognize the role of technology in Calculus, understand when it should be used, and be aware of its limitations.

Required Text: Calculus: Early Transcendental Functions; Smith and Minton, 4th Edition

Technology: Laptop running Mathematica recommended.

Attendance: Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. If you accumulate 3 unexcused absences you will be dropped from the class with a grade of DF recorded. When absent, you are responsible for all material covered in class. Missing class has no effect on assignment due dates.

Late Work: Unless specific permission is given in advance of the due date, no late work will be accepted.

Cell Phones: This is very simple - no cell phones can be used or even visible in our classroom. This includes before, during, and after class. If a cell phone is seen, the student may be asked to leave the classroom and the day will be counted as an unexcused absence.

Community: Please feel free to become an active member of our department's community. Each of the three disciplines in our department has a student club and you should join! The Roanoke College Student Chapter of the Mathematical Association of America (or "Math Club" for short) meets every other week, plays and learns about games and hosts evening events and the annual Pi-Day celebration! In addition, our department offers MCSP Tea every week on Thursdays from 2:15-3:15pm; come by Trexler 271 to talk to and meet other students as well as chat with the MCSP faculty members in a casual setting!

Reading and Participation: The key to learning a topic in mathematics is participation. We will strive to have an active, rather than passive, classroom environment. The last page of the syllabus is a day-by-day outline of the sections that will be discussed in class. You are fully expected to have read the upcoming section before the class meeting! This does not mean you need to understand everything, but rather you should be familiar with the definitions and concepts from the sections; having read the section will allow you to ask better questions and follow along better in class.

Co-Curricular Engagement: The MCSP Department offers a series of talks (MCSP Conversation Series) that appeal to a broad range of interests related to your fields of study. You are invited to be involved with all these meetings. After attending, submit a one-page paper reflecting on the discussion through Inquire. These reflection papers earn **extra credit**, with .5% add to your course average for each attended, up to 2% total. In addition, individually you may request that other appropriate events can count.

Academic Integrity: Students are expected to follow the integrity policy detailed in the handbook *Academic Integrity at Roanoke College*. Additionally, if you are ever uncertain as to how the College’s policy pertains to any assignment or exam in this course, please ask me for clarification. The bottom line is that all work that a student submits for a grade must be **solely** the work of that student unless the instructor has given explicit permission for students to work together. You will have the opportunity on some quizzes and our main project to collaborate with another as you work in pairs. It is critical that you understand that collaboration means both parties are contributing equally and meaningfully to the assignment. Adding your name to the work of another, as well as using a divide-and-conquer approach, are both examples of seeking credit for work that is not your own.

Grading Components

Testing: As described in more detail on the next page, we will be making use of mastery-based testing.

Problems of the Day: At the end of each class period during which content is discussed, practice problems will be assigned. It is expected that students work all these problems. To keep you from procrastinating and to measure understanding, an overwhelming majority of class days will begin with a “problem of the day”. When you enter the classroom there will be a problem displayed for you to work and turn in. This problem will be due 5 minutes after the start of our class time regardless of when you enter the classroom.

Recitation: You must be enrolled in the recitation portion (MATH 121R) of the course. The recitation will review important concepts needed for calculus (such as trigonometry and exponential functions) and provide practice time for concepts introduced in MATH 121. While MATH 121R operates as a separate course content-wise, please realize that grades from MATH 121R feed into MATH 121, counting 10% of the grade. Consult the recitation course syllabus for additional information on policies and grading.

Grading: Components of a student’s grade will be weighted as follows:

Mastery: 80%

Problem of the Day: 10%

Recitation: 10%

A scale will for final grades will be not be lower than the scale given below.

0	60	63	67	70	73	77	80	83	87	90	93
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

Testing: We will be making use of **mastery-based testing** rather than a points-based system. Mastery-based testing is very different from what you are used to – do not hesitate to ask me questions.

Description: You only receive credit for answers that demonstrate you completely understand (have mastered) a topic. But you get many chances to display mastery throughout the semester with no penalty whatsoever for earlier attempts.

- The course has been boiled down to 18 essential types of questions, or “topics”.
- Each problem submitted is graded as either “Mastery” or “Not Mastered”. A grade of Mastery indicates that you have demonstrated full understanding of the concept being tested and further work on the topic is not necessary.
- Once you have mastered a problem you need not ever attempt it again.
- There is no penalty whatsoever for multiple attempts taken to achieve mastery.
- Mastery does not mean perfect; it means you understand and can demonstrate all fundamentals of the topic and are proficient at the level desired for the course – you do not need to study the topic further.

Mastery Opportunities: You will have the opportunity to work mastery problems roughly every other Friday. On a given mastery day, new topics are REQUIRED – you must make a good faith effort at the new topics to have any mastery problems graded that day.

Grading: Your overall test grade is then determined by the number of topics you have mastered.

#Mastered	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Exam Grade	100	96	92	88	84	80	76	72	68	64	60	56	52	48	40	30	20	10

Notes on Master-Based Testing

- Clear content objectives, students continually know exactly what they need to work on to improve.
- Credit only for eventual mastery. No partial credit. Multiple attempts with complete forgiveness.
- A points-based system sets arbitrary deadlines by which time perfection must be attained.
- Perseverance: Points – try a problem once, maybe twice, hope for the best.
Mastery – Keep trying until you succeed (and I know you can)
- Use of feedback: Points – do I agree with the instructors grading
Mastery – what can I do to demonstrate that I understand the concept (improvement!)
- Reduced Test Anxiety: Points – every test has the potential to damage your GPA.
Mastery – no one test can harm your grade.
- Intelligent Test Preparation: You may choose to skip problems on a test. Better to achieve mastery on some than to demonstrate mediocrity on all.
- No longer will any of us have to wonder just what exactly a 7/10 means on a problem compared to an 8/10...
- A “broad and superficial” strategy may earn a C or D in a points-based system, in mastery you will fail.

Course Schedule This course expects you to spend at least 12 hours of work each week inside and outside of class.

Wed	Aug 28			Introduction
Fri		Topic 1	1.2	The Concept of Limits
Mon	Sept 2	Topic 1	1.3	Computation of Limits
Wed		Topic 2	1.4	Continuity and Its Consequences
Fri		Topic 3	1.5	Limits Involving Infinity
Mon	Sept 9	Topic 4	2.1, 2.2	Tangent Lines and Velocity
Wed		Topic 4	2.1, 2.2	The Derivative
Fri		Mastery Day		
Mon	Sept 16			Mathematica Day
Wed		Topic 5	2.3, 2.4	The Power, Product, and Quotient Rules
Fri		Topic 6	2.5	The Chain Rule
Mon	Sept 23	Topic 7	2.6, 2.7	Derivatives of Trig, Exponential, and Logarithmic Functions
Wed			3.8	Derivatives Recap
Fri		Mastery Day		
Mon	Sept 30			Derivatives in Mathematica
Wed		Topic 8	3.2	L'Hopital's Rule, Indeterminate Forms
Fri		Topic 9	3.3	Maximum and Minimum Values
Mon	Oct 7	Topic 9	3.4	Increasing and Decreasing Functions
Wed		Topic 10	3.5, 3.6	Concavity and Curve Sketching
Fri		Mastery Day		
Fall Break				
Mon	Oct 21	Topic 11	3.1	Linear Approximations and Newton's Method
Wed		Topic 12	2.8	Implicit Differentiation
Fri		Topic 12	3.8	Related Rates
Mon	Oct 28	Topic 13	3.7	Optimization
Wed		Topic 13	3.7	Optimization
Fri		Mastery Day		
Mon	Nov 4	Topic 14	4.1	Antiderivatives
Wed		Topic 15	4.2	Sums
Fri		Topic 15	4.3	Area
Mon	Nov 11	Topic 15	4.4	The Definite Integral
Wed				
Fri		Mastery Day		
Mon	Nov 18	Topic 16	4.5	The Fundamental Theorem of Calculus
Wed		Topic 17	4.6	Integration by Substitution
Fri				Integration Recap
Mon	Nov 25	Topic 18	7.1	Modeling with Differential Equations
Mon	Dec 2	Topic 18	7.2	Separable Differential Equations
Wed		Mastery Day		
Fri		Course Wrap Up		
Tue	Dec 10	Mastery Day		Final Exam Block, 8:30-11:30am