

## Ma 135-2: Calculus I

### Fall 2024

Instructor:	Dr. Laurel Carpenter
Office   Office Hours:	AL 46   MWF 9am or by appointment
Contact:	<a href="mailto:lcarpen@bju.edu">lcarpen@bju.edu</a>
Classroom   Class Hours:	AL 302   MWF 1-1:50 pm & T 12:30-1:20 pm
Textbook(s):	<i>Calculus</i> , 11e by Larson & Edwards, ISBN: 978-1-337-27534-7
Calculator Requirements:	TI 89 or Nspire CAS (or TI 83, 84 or Nspire if final mathematics course).

**Catalog Description:** Introduction to analytic geometry, functions, limits and differentiation of algebraic functions and transcendental functions, definite and indefinite integration, and applications.

**Prerequisites:** At least a grade of C in MA 105, Trigonometry, or by placement test or with ACT score of 31+

**Context:** The faculty of the Division of Mathematical Sciences has developed four broad goals and has aligned these goals with the Bob Jones University Institutional Goals and Liberal Arts Core. The Division Goals (DG) are as follows:

The student will...

1. Understand the essential theory of mathematics ... and appropriately apply the theory in solving problems.
2. Use critical-thinking/analytical skills to understand mathematical ... problems and design solutions with the aid of appropriate tools.
3. Apply an understanding of how mathematics/computing can be used in service to Christ as tools to the examination of the world He created.
4. Construct a foundation upon which they, after graduation, can continue the development of their God-given abilities and the learning necessary for work and life.

**Course Goals:**

1. To develop skill and techniques of differentiation and integration--the basic computations of calculus (DG 1, 2)
2. To develop mathematical modeling and problem-solving skills with the power of calculus tools (DG 2, 3)
3. To prove the basic theory of differential and integral calculus (DG 1)
4. To develop a greater appreciation for the beauty and power of calculus (DG 1, 2, 3)
5. To develop mathematical maturity, independent thinking, and reasoning skills (DG 1, 2, 4)
6. To develop personal qualities such as perseverance and diligence. (DG 3, 4)
7. To develop a greater interest in exploring mathematical ideas independent of the teacher (DG 2, 3, 4)
8. Ensure that students have the necessary calculus skills to be successful in everyday life. (DG 2, 3, 4)
9. Demonstrate mathematics as a tool that reveals order and design in the universe (DG 3)

**Course Objectives:**

	The students will be able to	Course Goals Supported	Course Content	Assessment
1.	State definitions of all terms and concepts encountered during the semester. (NCTM/CAEP 1c, 2b)*	3, 4, 5, 6	Chap P-4, 7	Tests
2.	State all theorems with names (e.g., Mean Value Theorem) encountered during the semester. (NCTM/CAEP 1e, 2b)	3, 4, 6	Chap P-4, 7	Tests
3.	Prove all theorems proven in class. (NCTM/CAEP 1e, 2b)	3, 4, 5, 6	Chap P-4, 7	Tests
4.	Numerically estimate the value of a limit. (NCTM/CAEP 1c)	1, 2	Chap 1	Test
5.	Numerically estimate the value of a definite integral. (NCTM/CAEP 1c)	1, 2	Chap 4	Test
6.	Relate geometric concepts to finding the area between curves, volumes, surface areas of solids of rotation, and arc length. (NCTM/CAEP 1c, 1e, 2a)	1, 2, 8, 5, 6	Chap 7	Tests
7.	Solve problems involving the following: 1) equations and inequalities, 2) graphs of functions and relations, 3) absolute values, 4) limits, derivatives, and integrals of	1, 2, 8, 9, 4, 5, 6	Chap P-4, 7	Tests, Theory Project

	algebraic and trigonometric functions, 6) maxima, minima, and inflection points (NCTM/CAEP 1b, 1c, 1e)			
8.	Use graphing technology to explore problems not normally treatable using classical calculus techniques and to gain a deeper understanding of concepts. (NCTM/CAEP 1c, 2c, 4c)	2, 8, 7	Chap P-4, 7	Tests
9.	Apply calculus to real-world situations. (NCTM/CAEP 1c, 2a, 2b, 2c, 4c)	1, 2, 8, 7	Chap P-4, 7	Tests, Application Problem Sets
10.	Discuss a biblical worldview of mathematics in general and calculus in particular.	9	Entire Course	Worldview Project

\*National Council of Teachers of Mathematics (NCTM/CAEP, 2020) Content Standards

**Note: Calculus is the foundation for many of the math you will need in your upper-level science and math classes. Learn it well.**

**Grades:**

Tentative Assignments	Points
In-Class Chapter Tests	500
Application Problem Sets	120
Mid-term Theory Test	50
Final Theory Test	50
In-Class Activities/Quizzes	110
Worldview Project	30
Theory Project	30
Exercises	70
Final Exam	<u>150</u>
<b>Total</b>	<b>1110</b>

**Other Opportunities for Credit:**

Each chapter has a **Chapter Review** in which the problems do not specify the section from which they come giving you the opportunity to determine which concepts and solution methods are necessary to solve a given problem similar to what you must do on a chapter test. Doing these problems will better prepare you for the chapter tests. You may earn 2 pts per chapter for doing the odd-numbered problems in the Chapter Review section for Chapters P, 1 and 2, 3, 4. To count for credit, the Chapter Review must be completed before that chapter’s test.

There are two **Additional Sections** that you may find interesting to study on your own. You may earn 2 pts per section for reading sections 3.8 and 3.9 and completing the problems listed here. To count as credit, these sections must be completed before the Chapter 3 test.

**Sec 3.8** - 1, 5, 15, 19, 21, 23, 25

**Sec 3.9** - 1, 7, 9, 11, 21, 25, 29, 43-45, 47-49

Engaging with the mathematics community outside of the calculus classroom by attending and writing a brief reflection on a **Mathematical Sciences Symposium**. Math Sci Symposia are sometimes fun nights with puzzles or games and sometimes they are serious talks about complex mathematics. Even if the talk goes a bit over your head, experiencing mathematics in action can give you a sense for how interesting, far reaching, and interconnected mathematics is. Look for these symposia on the first Thursday of each month. You may earn 2 pts per symposium for up to three symposia. After (or while) attending the symposium, you should write a brief reflection giving the date and title of the talk, the name of the speaker, and two or three things you found interesting about the talk. To count as credit, the reflection must be submitted within 24 hours of the symposium.

**Grading Scale:** Percentages will be calculated out of a total of 1110 points for the semester. Each letter grade will be subdivided as usual following the standard BJU grading scale.

90% - 100%	A
80% - 89%	B
70% - 79%	C
60% - 69%	D

**Need Help?**

I want you to be successful in this class. You must seek help when needed because you are the only one who knows when you need it. If you need help, reach out in one of the following ways:

1. Solutions manuals with work are available in the Math Lab, Mack Building 201.
2. Online solutions to homework problems (may charge a fee) – Slader.com for all problems, CalcChat.com for odd-numbered problems.
3. Instructor – Use me – I want to see you in my office.
4. Classmates – Find (or start) a study group.
5. Dr. Guthrie's Study Sessions – A retired professor has graciously offered his time to work with any Calculus 1 students. He will hold study sessions on MWF in AL 301
6. There is a lab assistant in the Math Lab any time the Mack Building is open. This lab assistant is qualified to help you with Calculus 1 questions. Feel free to go there for help as needed.

**In-Class Activities/Quizzes:**

In-class activities/quizzes may be announced or unannounced. Always be ready. The lowest activity/quiz grades will be dropped when calculating final grades. Missed activities/quizzes due to absence of any kind will not be made up.

**Personal Study:**

Practice by working **Exercises** is crucial to success in this course. It is also one of the primary means by which you represent yourself well in academia, and the way in which you will develop the mathematical habits that will help you be successful on the larger quizzes and tests.

Doing the assigned exercises is only the first step to learning the material. You do not truly begin studying until you have completed (and checked) the exercises and spent time looking at how the concepts fit together as a whole.

Exercises are collected in Canvas.

**Theory Drives Application:**

Most exercise sections (see Schedule) have two or three problems shaded in gray. These problems must be completed using the *Theory Drives Application framework* described below. The purpose of doing these exercises using this framework is to help you see how an understanding of application grows out of an understanding of theory.

**Theory Drives Application Framework:**

- a. State the problem: Write the problem as stated in the textbook.  
Also, sketch the problem at the top right corner of the page.
- b. State the theory: Write the statement(s) of any definitions, rules, or theorems that apply.
- c. Outline the strategy: Write the steps you will take in applying the theory to solve the problem.
- d. Solve the problem: Concisely and completely write out the solution.

Before you start, block off a 3"x 2" rectangle at the top right corner of the page in which to sketch the problem.

Try to keep all elements of this framework in order. It is best if you can write all elements on one page; however, sometimes this is not possible. If more than one page is needed, use only the front sides of each piece of paper and number the pages. Plan ahead so no single element is broken onto two pages (except possibly element d but only if the solution is itself longer than one full page).

**Classroom Deportment:**

The classroom should be an environment of mutual respect and inclusion. While in attendance students are expected to focus on course-related material and to contribute positively to the classroom discourse. The instructor reserves the right to ask a student to leave the classroom should their attention be elsewhere (sleeping, surfing the internet, working on assignments for another class, etc.)

**Accommodations for students with disabilities:**

If you have a documented learning disability or chronic illness or if you are impaired in some way (auditory, visual, cognitive, neurological, or physical), please let your instructor know this within the first week of the course so that any necessary adjustments can be made before you get behind.

**Attendance Policy:**

Regular attendance is very important in this class. If you miss a class, you will be missing some essential information that will help you be more successful in your career. I will follow the BJU Attendance Policy that is set forth in your Student Handbook. For additional information, please see the current Bob Jones University Student Handbook.

Naturally, if you are absent on a day when you have been informed in advance that work is due, then the late policy is (10% deduction for each calendar day late) and applies for that assignment regardless of the nature of the absence.

**Academic Integrity:**

The University's academic integrity policy is in effect (see <https://home.bju.edu/bju-policies/> for more details).

**Artificial Intelligence:** Because the goals of the assignments in this course are to develop skills and mathematical intuition rather than simply to complete tasks, and because the use of AI to complete or jumpstart tasks defeats the goal of these assignments, you may not use generative AI tools (e.g., Chat GPT, Bing Chat, Google Bard, etc.) in this course for any assignment without the professors' explicit permission. Should an AI tool be used with permission, its use must be documented (including the tool used, a summary of the prompts provided and the portions of the assignment that were based on AI generated work).

Likewise, **Computer Algebra Systems** (e.g., TI-NSpire CAS, Wolfram Alpha, etc.) that generate algebraic answers and/or solutions are not to be used to generate your work in this course.

**Cheating and Plagiarism:** Cheating is defined as any use of unauthorized help. Plagiarism is defined as taking someone else's words and/or ideas and claiming them as one's own. All work done for this course must be independent and original. If information is taken from other sources (which may at times be appropriate), it must be adequately cited so credit is given to whom it is due. Use standard referencing techniques as taught in En 102.

**Originality:** Students are permitted (and encouraged) to discuss the ideas from this course but are not permitted to collaborate with anyone other than their instructor on the specific problems/solutions on the major assignments (Application Problem Sets, Theory Project, Worldview). Unless working on a group project with the explicit permission and direction of the instructor, all papers and presentations for this course should represent the student's own ideas and their own work and should be the product of their own thinking and efforts. A student may not use AI to generate any portion of their papers or presentations without explicit permission from their professor (and if permission is granted it must be documented as described above).

**Ask Your Instructor:** If you have a question about any source you are considering using, please gain your instructor's approval before using it. You are always permitted to ask your professor for help. Any help they choose to provide is acceptable.

**Calculus Forevers**  
Theory to be memorized.**Statements of definitions, rules, and theorems:****Proofs of rules and theorems:****Chapter P and Appendix C.1**

**slope** (of a line)  
**function**  
**absolute value**  
**Triangle Inequality**  
**less than**

**Triangle Inequality**

**Chapter One**

**limit** (of a function at a point)  
**Sandwich Theorem**  
**continuity** (at a point)  
**Intermediate Value Theorem**

**limit of a constant**  
**limit of a sum**

**Chapter Two**

**derivative** (general definition)  
**derivative** (of a function at a point)

**Chain Rule**

**derivative of a sum**  
**Product Rule**  
**Chain Rule**

**Chapter Three**

**absolute maximum/absolute minimum**  
**relative maximum/relative minimum**  
**increasing function/decreasing function**  
**critical value**  
**Extreme Value Theorem** (for derivatives)  
**Rolle's Theorem**  
**Mean Value Theorem**  
**concave downward/concave upward**  
**inflection point**

**Rolle's Theorem**  
**Mean Value Theorem**

**Chapter Four**

**indefinite integral**  
**definite integral**  
**limit of a Riemann Sum**  
**Mean Value Theorem** (for integrals)  
**Fundamental Theorem of Calculus (Parts 1 and 2)**

**Mean Value Theorem** (for integrals)  
**Fundamental Theorem of Calculus (Parts 1 and 2)**

## Ma 135 Fall 2024 Tentative Schedule

Schedule			
Date	Day	Class	Assignments (Problem numbers shaded in gray are <b>Theory Drives Application</b> problems.)
8/28	W	Syllabus, P.1, P.2,	
8/30	F	P.3	HW Completed: <b>P.1</b> – 3-6, 7, 13- 29 odd, 33, 37, 47, 59, 61, 70, 71, 75-78 HW Completed: <b>P.2</b> - 3-9 odd, 10, 13, 15, 16, 20, 23, 29-34, 37-40, 45, 47, 55, 61, 64, 65, 71b, 72
9/2	M	<b>Labor Day</b>	
9/3	T	Appendix C.1, P.4	HW Completed: <b>P.3</b> - 8, 11, 12, 18, 22, 23, 26, 27, 37, 39, 40, 41, 44, 49, 51-56, 57, 61, 63, 67, 75, 99
9/4	W	P.4	HW Completed: <b>C.1</b> - 15, 16, 17, 19, 21-24, 26, 27, 29, 30, 31, 33, 37, 38, 39, 41, 43, 53, 54, 57, 58, 59, 62, 67-72, 73-75, 82
9/6	F	Review	HW Completed: <b>P.4</b> – 9, 11, 13, 15, 23, 25, 31, 37, 39, 43, 45, 55, 59, 67
9/9	M	<b>Chapter P and Appendix C.1 Theory Test</b>	
9/10	T	<b>Test: Chapter P and Appendix C.1</b>	
9/11	W	Section 1.1, 1.2	<b>*** Worldview Reflection 1 Due ***</b>
9/13	F	Section 1.2	HW Completed: <b>1.1</b> - 3, 5, 6, 7, 9, 10
9/16	M	Section 1.3	HW Completed: <b>1.2</b> - 5, 7, 8, 11, 21, 23, 25-27, 29-41 odd, 47, 49, 51, 52, 55, 59, 73-76
9/17	T		HW Completed: <b>1.3</b> - 1, 4, 5-21 odd, 25, 27, 29, 31, 33, 37, 39, 43, 47-81 odd, 83-91 odd, 97, 103-104, 115, 117-120, 122
9/18	W	Section 1.4	
9/20	F	Section 1.4	HW Completed: <b>1.4</b> – 5-15 odd, 17-23 odd, 33, 35, 37, 39
9/23	M	Review/Catch up <b>Chapter 1 Theory Test</b>	HW Completed: <b>1.4</b> – 47, 59, 63, 67, 83, 89, 97, 105, 106, 109, 110, 115, 117
9/24	T	Section 2.1	
9/25	W	<b>REACH Seminars—No Classes</b>	
9/27	F	<b>Test: Chapter 1</b>	
9/30	M	Section 2.2	HW Completed: <b>2.1</b> - 5, 7, 8, 9, 13, 15, 21, 27, 31, 35, 37, 43, 45, 46, 53, 55, 57, 61, 64, 69, 79, 80, 93-96
10/1	T	Section 2.3	HW Completed: <b>2.2</b> - 5a, 6b, 7-25 odd, 29, 31- 51 odd, 55, 59-67 odd, 68, 66, 69, 71, 74, 85-90, 97, 99, 105, 107, 111, 114
10/2	W	Section 2.3	HW Completed: <b>2.3</b> – 5-16, 17-19 odd, 29-39 odd, 41-51 odd
10/4	F	Section 2.4	HW Completed: <b>2.3</b> – 57, 59, 65, 67, 75, 81, 83-85, 87, 91-97 odd, 101-07 odd, 108, 111, 114, 125, 133-137
10/7	M	Section 2.4	HW Completed: <b>2.4</b> – 3-5, 9-31 odd, 35-47 odd, 55, 59, 61
10/8	T	Section 2.5	HW Completed: <b>2.4</b> – 63, 65, 67, 71, 79, 87, 90, 93-94, 95, 97, 99, 110, 111, 112
10/9	W	Review/Catch up <b>Chapter 2 Theory Test</b>	HW Completed: <b>2.5</b> – 5-13 odd, 21, 25-29, 35, 49-450, 57-63 odd
10/11	F	<b>Test: Chapter 2 (Sections 1-5)</b>	
10/14	M	Section 2.6	
10/15	T	Section 3.1	HW Completed: <b>2.6</b> - 3, 5, 7, 11, 14-18, 21, 23, 37, 48
10/16	W	Section 3.2	HW Completed: <b>3.1</b> - 7-19 odd, 23-33 odd, 56, 60, 57-58, 61, 65-68
10/18	F	<b>Mid-Term Theory Test</b> Section 3.3	HW Completed: <b>3.2</b> - 3-15 odd, 16, 17, 31, 34, 35, 39, 47, 49, 53, 55-59, 65, 71, 73-77
10/21	M	Fall Break	
10/22	T	Fall Break	
10/23	W	Section 3.3	<b>***Applications Problems Set 1 due***</b>
10/25	F	Section 3.3, 3.7	HW Completed: <b>3.3</b> – 3, 6, 7-13 odd, 19, 23, 27, 29-35 odd, 39, 60-61, 63-66, 70 (i, iii), 89, 91-96

Schedule (continued)			
Date	Day	Class	Assignments (Problem numbers shaded in gray are Theory Drives Application problems.)
10/28	M	Section 3.4	HW Completed: 3.7 - 3, 7, 11, 13, 15, 19, 21, 23, 29, 37, 38, 41 *** Worldview Reflection 2 due ***
10/29	T	Section 1.5, 3.5	HW Completed: 3.4 - 3-5, 7, 17, 23, 37, 39, 45, 49, 52, 55, 61, 75-80
10/30	W	Section 3.6 Review/Catch up	HW Completed: 1.5 - 3-5, 7-11, 17-27 odd, 33-43 odd, 51, 57, 71 3.5 - 7-10, 13, 15, 20, 25-31 odd, 39, 40
11/1	F	Review <b>Chapter 3 Theory Test</b>	3.6 - 5-8, 9, 23, 27, 33, 51, 52, 53, 78, 79
11/4	M	<b>Test: Chapter 3 (Sections 1-6)</b>	
11/5	T	Section 4.1	*** Worldview Reflection 3 due ***
11/6	W	Section 4.2	HW Completed: 4.1: 5-13 odd, 17-41 odd, 63, 74-76
11/8	F	Section 4.2	
11/11	M	Section 4.3	HW Completed: 4.2: 7-13 odd, 19-25 odd, 29, 35, 37, 45, 51, 59, 63
11/12	T	Section 4.4	*** Applications Problems Set 2 due ***
11/13	W	Section 4.4	HW Completed: 4.3: 6, 9, 11, 12, 13-17 odd, 27-37 odd, 41, 43, 63-66
11/15	F	Section 4.5	HW Completed: 4.4: 11-33 odd
11/18	M	Section 4.5	HW Completed: 4.4: 37-45 odd, 51, 53, 57, 60, 62, 63, 69, 71, 77, 83 *** Formative Worldview of Mathematics Paper due ***
11/19	T	Review/Catch up	HW Completed: 4.5: 7-27 odd, 39-49 odd, 53, 55, 63, 71, 72
11/20	W	<b>Chapter 4 Theory Test</b>	
11/22	F	<b>Test: Chapter 4 Problems</b>	
11/25-29	M-F	<b>Thanksgiving Break</b>	
12/2	M	Section 7.1	*** Theory Paper due ***
12/3	T	Section 7.2	HW Completed: 7.1: 7, 9, 11, 16, 17, 23, 25, 33, 39, 43, 53, 57, 79
12/4	W	Section 7.2	
12/6	F	Section 7.4	HW Completed: 7.2: 5-17 odd, 21, 23, 57, 62, 65 (integrate by hand)
12/9	M	Section 7.3	HW Completed: 7.4: 7, 12, 13, 21, 25, 39, 45, 66
12/10	T	Review/Catch up	HW Completed: 7.3: 3-11 odd, 23, 25, 29, 39, 47, 49
12/11	W	<b>Final Theory Test</b>	
12/13	F	Review	*** Application Problems Set 3 due ***
12/16, 12:30 pm	M	<b>Final Exam</b>	