

Ma 200 – Calculus I

Fall, 2023

Motto: Theory Drives Application

Instructor:	Section 1: Dr. Laurel Carpenter	Section 2: Dr. Kathy Pilger
Office:	AL 46	AL 55
Office Hours:	MF 1pm, TW 9 am, or by appointment	2 pm daily, others by appointment
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Class Hours:	MTWTF 10-10:50 am	MWF 1-1:50 pm, T 12:30-1:20 pm
Textbook(s):	<i>Calculus</i> , 11 th Edition, Larson & Edwards	
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; and thus, develop within the student the conviction that God's creation is rationally knowable (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, Applications Activities
10.	Discuss the 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
Applications Activities	120
Mid-term Theory Test	50
Final Theory Test	50
In-Class Activities/Quizzes	≈ 110
Worldview, Theory Project	50
Homework	70
Final Exam	<u>150</u>
Total	1110

Extra Credit:

Each chapter has review problems at the end of the chapter in which the problems do not specify the section from which they come. Thus, you must determine which concepts and solution methods are necessary for solving these problems, similar to what you must do on each chapter test. Doing these problems will better prepare you for each chapter test. Thus, you may earn **3 pts of extra credit per chapter** for doing the odd-numbered problems in the Chapter Review section for Chapters P, 1 and 2, 3, 4. You may also earn **2 pts of extra credit each** for reading sections 3.8 and 3.9 and doing the assigned problems listed here.

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

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

Thus, you may earn up to **19 pts of extra credit** for the semester. Take advantage of it!!

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 a Study Buddy.
5. 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 will be announced or unannounced. Always be ready. The lowest quiz grade will be dropped when calculating final grades. Missed quizzes due to absence of any kind will not be made up.

Homework:

Homework is crucial to success in this course. It is also one of the primary means by which you represent yourself as a “professional” 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 homework is only the first step to learning the material. You do not truly begin studying for the chapter test until you have done the homework and then spend time looking at how the concepts fit together as a whole.

Homework is collected in Canvas.

Theory Drives Application:

Most sections of homework problems (see Schedule) have two or three problems shaded in gray. These problems must be completed on the **Theory Drives Application** homework template. These are to be uploaded to Canvas with your Homework. The purpose of these assignments is to help you see how **Theory Drives Application**. It will include a space where you write the statement of the definition or theorem that applies to that problem as well as a space for you to write the steps you will take to use the theory to work the problem. The final space will be for you to work the problem according to your plan.

Classroom Deportment:

Compliance with student handbook policies is expected during class. Cell phones must be muted during class. You should be prepared to take notes in class. Remember this is an academic setting and an atmosphere of engaged learning is expected.

Accommodations for students with disabilities:

If you have a documented learning disability 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 claiming of someone else's work as your own is cheating. All work done for this class needs to be your own. If information is taken from other sources (including, but not limited to, artificial intelligence and computer algebra systems) it always needs to be referenced and credit given where it is due. I value academic integrity. Therefore, I will take appropriate action if cheating or plagiarism occurs in this course. For additional information, please see the current Bob Jones University student handbook. **You may not work together on Application Activities or the Theory Project.** I encourage you, however, to work together on your homework.

Note on Artificial Intelligence: Unless specifically stated in writing by the instructor for a specific project/purpose, the use of artificial intelligence or computer algebra systems to generate your work in this course is forbidden. The use of such technology is considered cheating (even if proper citation is included) and will be reported as an academic integrity offense. See the current Bob Jones University student handbook.

Calculus Forevers

Statements of definitions and theorems:

Chapter P and Appendix C.1

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

Chapter One

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

Chapter Two

derivative (general definition)
derivative (of a function at a point)
Chain Rule

Chapter Three

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

Chapter Four

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

Proofs

1. Triangle Inequality
2. limit of a constant
3. limit of a sum
4. derivative of a sum
5. Product Rule
6. Chain Rule
7. Rolle's Theorem
8. Mean Value Theorem (for derivatives)
9. Mean Value Theorem (for integrals)
10. Fundamental Theorem of Calculus (Parts 1 and 2)

Ma 200 Fall, 2023 Tentative Schedule

Schedule			
Date	Day	Class	Assignment (Problem numbers shaded in gray are Theory Drives Application problems.)
8/ 23	W	Syllabus, P.1, P.2,	
8/ 25	F	P.3	HW Completed: P.1 – 3-6, 7, 13- 29 odd, 33, 37, 47, 59, 61, 70, 71, 75-78 HW Completed: P.2 - 3-9 odd, 10, 13, 15, 16, 20, 23, 29-34, 37-40, 45, 47, 55, 61, 64, 65, 71b, 72
8/ 28	M	Appendix C.1, P.4	HW Completed: P.3 - 8, 11, 12, 18, 22, 23, 26, 27, 37, 39, 40, 41, 44, 49, 51-56, 57, 61, 63, 67, 75, 99
8/ 29	T	P.4	HW Completed: C.1 - 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
8/ 30	W	Review	HW Completed: P.4 – 9, 11, 13, 15, 23, 25, 31, 37, 39, 43, 45, 55, 59, 67
9/ 1	F	Test: Chapter P and Appendix C.1	
9/ 4	M	Labor Day (no classes)	
9/ 5	T	Section 1.1, 1.2 *Worldview Project	*See Canvas for Worldview Project due date(s) during September.
9/ 6	W	Section 1.2	HW Completed: 1.1 - 3, 5, 6, 7, 9, 10
9/ 8	F	Section 1.3	HW Completed: 1.2 - 5, 7, 8, 11, 21, 23, 25-27, 29-41 odd, 47, 49, 51, 52, 55, 59, 73-76
9/ 11	M		HW Completed: 1.3 - 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/ 12	T	Section 1.4	
9/ 13	W	Section 1.4	HW Completed: 1.4 – 5-15 odd, 17-23 odd, 33, 35, 37, 39
9/ 15	F	Review/Catch up Theory Test: Chapter 1	HW Completed: 1.4 – 47, 59, 63, 67, 83, 89, 97, 105, 106, 109, 110, 115, 117
9/ 18	M	Test: Chapter 1	
9/ 19	T	Section 2.1	
9/ 20	W	Section 2.2	HW Completed: 2.1 - 5, 7, 8, 9, 13, 15, 21, 27, 31, 35, 37, 43, 45, 46, 53, 55, 57, 61, 64, 69, 79, 80, 93-96
9/ 22	F	Section 2.3	HW Completed: 2.2 - 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
9/ 25	M	Section 2.3	HW Completed: 2.3 – 5-16, 17-19 odd, 29-39 odd, 41-51 odd
9/ 26	T	Section 2.4	HW Completed: 2.3 – 57, 59, 65, 67, 75, 81, 83-85, 87, 91-97 odd, 101-07 odd, 108, 111, 114, 125, 133-137
9/ 27	W	Section 2.4	HW Completed: 2.4 – 3-5, 9-31 odd, 35-47 odd, 55, 59, 61
9/ 28	F	Section 2.5	HW Completed: 2.4 – 63, 65, 67, 71, 79, 87, 90, 93-94, 95, 97, 99, 110, 111, 112
10/ 2	M	Review/Catch up Theory Test: Chapter 2	HW Completed: 2.5 – 5-13 odd, 21, 25-29, 35, 49-450, 57-63 odd
10/ 3	T	Test: Chapter 2	
10/ 4	W	Section 2.6	Applications Activity 1 (Related Rates) handout available in Canvas.
10/ 6	F	Section 3.1	HW Completed: 2.6 - 3, 5, 7, 11, 14-18, 21, 23, 37, 48
10/ 9	M	Section 3.2	HW Completed: 3.1 - 7-19 odd, 23-33 odd, 56, 60, 57-58, 61, 65-68
10/ 10	T	Section 3.3	HW Completed: 3.2 - 3-15 odd, 16, 17, 31, 34, 35, 39, 47, 49, 53, 55-59, 65, 71, 73-77
10/ 11	W	Section 3.7 Mid-Term Theory Test	
10/ 13	F	Applications Activity 1 due	HW Completed: 3.3 – 3, 6, 7-13 odd, 19, 23, 27, 29-35 odd, 39, 60-61, 63-66, 70 (i, iii), 89, 91-96 Applications Activity 2 (Max/Min) handout available in Canvas.
10/ 16	M	Fall Break	
10/ 17	T	Fall Break	
10/ 18	W	Section 3.4	HW Completed: 3.7 - 3, 7, 11, 13, 15, 19, 21, 23, 29, 37, 38, 41
10/ 20	F	Section 1.5, 3.5	HW Completed: 3.4 - 3-5, 7, 17, 23, 37, 39, 45, 49, 52, 55, 61, 75-80
10/ 23	M	Section 3.6	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

10/ 24	T	Review/Catch up	HW Completed: 3.6 - 5-8, 9, 23, 27, 33, 51, 52, 53, 78, 79
10/ 25	W	Review Theory Test: Chapter 3	
10/ 27	F	Test: Chapter 3	
10/ 30	M	Section 4.1	
10/ 31	T	Section 4.2	HW Completed: 4.1 : 5-13 odd, 17-41 odd, 63, 74-76
11/ 1	W	Section 4.2	
11/ 3	F	Section 4.3	HW Completed: 4.2 : 7-13 odd, 19-25 odd, 29, 35, 37, 45, 51, 59, 63
11/ 6	M	Section 4.4 Applications Activity 2 due	
11/ 7	T	Section 4.4	HW Completed: 4.3 : 6, 9, 11, 12, 13-17 odd, 27-37 odd, 41, 43, 63-66
11/ 8	W	Section 4.5	HW Completed: 4.4 : 11-33 odd
11/ 10	F	Section 4.5	HW Completed: 4.4 : 37-45 odd, 51, 53, 57, 60, 62, 63, 69, 71, 77, 83
11/ 13	M	Review/Catch up	HW Completed: 4.5 : 7-27 odd, 39-49 odd, 53, 55, 63, 71, 72
11/ 14	T	Section 7.1	
11/ 15	W	Theory Test: Chapter 4	
11/ 17	F	Test: Chapter 4	
11/ 20-24	M-F	Thanksgiving Break	
11/ 27	M	Section 7.1	Applications Activity 3 (Integration) handout available in Canvas.
11/ 28	T	Section 7.2	HW Completed: 7.1 : 7, 9, 11, 16, 17, 23, 25, 33, 39, 43, 53, 57, 79
11/ 29	W	Section 7.2 Theory Project due	
12/ 1	F	Section 7.4	HW Completed: 7.2 : 5-17 odd, 21, 23, 57, 62, 65 (integrate by hand)
12/ 4	M	Section 7.3	HW Completed: 7.4 : 7, 12, 13, 21, 25, 39, 45, 66
12/ 5	T	Review/Catch up	HW Completed: 7.3 : 3-11 odd, 23, 25, 29, 39, 47, 49
12/ 6	W	Final Theory Test	
12/ 8	F	Review Applications Activity 3 due	
12/ 11-12		Final Exams	Section 1 – Tuesday 9:30 am Section 2 – Monday 12:30 pm