CALCULUS 1

MATH 152 (4 CREDITS)
DORDT COLLEGE – SPRING 2019

INSTRUCTOR INFORMATION

Name:	Dr. Melissa Lindsey
Email Address:	melissa.lindsey@dordt.edu
Office Phone:	712-722-6740
Office Location:	SB 1609 (1st floor of the science building)
Office Hours:	By Appointment - melissalindsey.youcanbook.me

CLASS INFORMATION

Meeting Location:	SB 1603	(1st floor of the science building)
Meeting Times:	Monday and Friday	12:00 pm – 12:50 pm
	Tuesday and Thursday	11:00 am – 11:50 am

COURSE DESCRIPTION

CATALOG DESCRIPTION

A study of the basic concepts and techniques of calculus for students in all disciplines. Topics include limits, differentiation, integration, and applications. This course is intended for students without any previous calculus credit.

PREREQUISITE

Grade of C- or higher in Math 115 or equivalent

REQUIRED TEXTS AND MATERIALS

TEXTBOOKS

1. Active Calculus Workbook, Chapters 1 – 4, 2018 edition by Boelkins, Austin, and Schlicker
   Print Copy Required

2. *Active Calculus*, 2018 edition by Boelkins, Austin, and Schlicker
   (Available for free at https://activecalculus.org/single/)

TECHNOLOGY

1. **Canvas** will be the primary tool I use to communicate with you regarding course materials, announcements, and your grades. You should make sure that you are in the habit of checking our course page on canvas for what is expected of you each day to be prepared for class. Canvas is available as a free mobile app.

2. **Graphing calculators** are an important tool when exploring calculus. The use of calculators is allowed (and sometimes encouraged) during class and when working on assignments. You may use a calculator on exams, but it must be a stand-alone calculator – not part of your cell phone or computer.

LEARNING OUTCOMES

At the end of the semester, students will be able to

1. Demonstrate mastery of the mathematical concepts that have driven the development of our understanding of the inner working of creation and technology over the past 400 years. (RO, CD)
2. Learn how to work with and apply techniques of limits, differentiation, and integration using standard methods of calculus. (CS)
3. Apply these tools and concepts to mathematical and real-world problems in a variety of settings. (CS, CR)

ASSESSMENTS

1. **Pre-class activities** – Prior to the class period during which we start a new section, you complete a guided inquiry assignment to introduce you to the topics from the section. These assignments will include reading the textbook, attempting some problems, and watching videos.

2. **Learning Target Exams** – There are 30 learning targets in this course (listed in the section titled 'Learning Targets'). Each learning target will be assessed on at least two exams. Each problem will earn a grade of E – "exceeds expectations", M – "meets expectations", R – "reassess – some progress shown, but the problem is incorrect or incomplete", or F – "failure to make progress".

3. **Derivative Gateway Exam –** One of the topics that we are going to spend a majority of the semester exploring is the derivative of a function. In order to properly explore and answer questions about applications, it is important that you differentiate a function quickly and correctly. To this end, you will take an exam on which you must correctly differentiate at least 9 of 12 functions given to pass.

4. **Four Coordinates Assignments** – You will have 4 assignments throughout the semester corresponding to the Four Coordinates that are outlined in the Educational Task of Dordt College. Details of each assignment will be given at least one week prior to the due date. You will submit these assignments on Canvas.

5. **Final** – The final exam will be comprehensive and will be used to determine how your base grade is modified (add a plus, leave unchanged, add a minus, drop a letter grade). The details are listed in the section on Grading.

GRADING

The letter portion of your course grade will be determined by the level at which you have achieved mastery on each of the assessments described on the previous page. In particular, the letter portion of your grade will correspond to the highest row in the following table which is fully completed.

Grade	Pre-Class Activities Completed (out of 28)	Gateway Exam	Learning Targets Passed		Four Coordinates Assignments Completed
			With an M or E	With an E	
A	24	Passed	28	24	4
B	19	Passed	25	18	3
C	14	Passed	22	0	2
D	0	Passed	16	0	1

The final exam will consist of 10 problems (each graded out of 10 points) corresponding to the learning targets that are marked with a * on the list of learning targets. The final exam will modify your base grade in the following way:

- If you earn 85 points or more, your base grade will have a **plus** attached to it (unless it is an A; Dordt does not award A+ grades).
- If you earn 65 – 84 points, your base grade will be **unmodified**.
- If you earn 50 – 64 points, your base grade will have a **minus** attached to it.
- If you earn 49 points or less, your base grade will **drop by a full letter grade.**

Note that if your base grade is an F, your course grade will be an F regardless of your performance on the final exam.

REASSESSMENTS AND REVISIONS

There are two goals of the assessments in this course. **The first goal** is to hold you accountable for being an active and engaged member of our classroom learning community. This is where the pre-class activities come into play. Since these are intended to keep you on pace with the course material, late submissions will not be accepted.

The second goal of the assessments is to measure how well you are meeting the learning outcomes of the course. However, I am primarily concerned with your ability to demonstrate mastery of the learning outcomes *eventually*, so the opportunity to reattempt or to revise and resubmit is available for the other assessment categories.

Reattempts: If you do not pass the gateway exam or a learning target during the scheduled exam times in class, you will be able to reattempt them outside of class. During non-exam weeks, you will be allowed to sign up by Tuesday at 1pm to reassess the gateway exam or up to 2 learning targets on Thursday immediately following class from 11:50 – 12:15. Learning Targets may only be reassessed up to the Thursday prior to the exam that is two exams after the first exam they appeared on (so learning targets 1 – 9 can only be reassessed up through Thursday March 28). Learning Targets 14 – 30 may be reassessed during the final exam block.

Revise and Resubmit: If your initial submission for a four coordinates assignment does not meet the requirements for passing, I will provide you feedback and ask you to revise and resubmit. You will have one week from after the feedback is given to submit your revision. As long as you are making forward progress, we will continue this process as many times as necessary up until finals week.

COURSE FORMAT

As indicated in the Assessment Section, you will be doing calculus in three different settings: Before Class, During Class, and After Class. Details of what is expected of you during each of those times are included below.

Before Class	I will assign guided inquiry activities to prepare you to engage with the more challenging parts of the content in class. If you do not complete these activities you will not be prepared to learn in class and you will impede the learning of your classmates. It is imperative as a member of our classroom community that you make a good faith effort to compete the guided inquiry activities. It is okay if you are confused or don't understand something. Coming to a class with a question about the pre-class work is entirely different than coming to class without having thought about it at all. To earn credit for the pre-class activity you must be in class when I am checking the assignments.
During Class	Our time together in class will be spent in three different ways: 1. Spending 0 – 5 minutes making sure we've answered any lingering questions regarding the pre-class activities. 2. Spending 35 – 45 minutes working on group activities designed to help you develop a deep understanding of calculus concepts and equip you to be able to demonstrate mastery of the learning targets. You will need access to your textbook to complete these activities. Please purchase a printed copy or bring a device to class to access it. 3. Spending 5 – 10 minutes coming together at the end of class to make sure we're all on the same page about what we learn that day.
After Class	After class, you are responsible for making sure that you understand the learning targets that were covered that day. To aid you in this process, I have listed relevant exercises in the section on learning targets. It is crucial to your learning that you do these problems, but since the answers and solutions are readily available in the textbook, they will not be collected.

GETTING HELP

- Ask your classmates! Both in and outside of class, your classmates are a wonderful resource on your journey through calculus.
- Ask me! In and out of class, I am here to help you understand and learn the course content. Whether it's in class, during office hours, or via email, I want you to be asking questions to make sure that your learning is on track. Please note that I will not routinely check my email in the evening or on weekends.
- The Academic Enrichment Center is located in the lower level of the library. You can sign up for free weekly tutoring appointments there! The majority of campus utilizes the AEC; you should too!
- Drop in tutoring is available in CL-91 from 7:00 pm – 9:00pm Monday through Thursday.

ATTENDANCE

You are an important part of our learning community and you are expected to be in class every day. Unexcused absences will prevent you from earning whatever points were available that day. In particular, if you miss class for an unexcused reason on a day when there is a pre-class activity due, you will not be able to earn points for that pre-class activity. If you miss class for an unexcused reason on a day when there is a test, a make-up test will not be given.

DORDT COLLEGE STUDENT'S RIGHT TO ACCOMODATIONS POLICY

Any student who needs access to accommodations based on the impact of a documented disability should contact the Coordinator of Services for Students with Disabilities (CSSD):

Marliss Van Der Zwagg, Academic Enrichment Center
marliss.vanderzwagg@dordt.edu, (712) 722-6490

DORDT COLLEGE ACADEMIC DISHONESTY POLICY

Dordt College is committed to developing a community of Christian scholars where all members accept the responsibility of practicing personal and academic integrity in obedience to biblical teaching. For students, this means not lying, cheating, or stealing others' work to gain academic advantage; it also means opposing academic dishonesty. Students found to be academically dishonest will receive academic sanctions from their professor (from a failing grade on the particular academic task to a failing grade in the course) and will be reported to the Student Life Committee for possible institutional sanctions (from a warning to a dismissal from the college). Appeals in such matters will be handled by the student disciplinary process. For more information see the student handbook.

LEARNING TARGETS

Bolded Learning Targets will be covered on the Final Exam.

1. Given information about a function (either a table of data or a graph), answer questions about its average and/or instantaneous rates of change. (Exercises, 1.1.1.1.1.2, 1.1.4, 1.1.5, 1.6.3)
2. **Sketch a graph that has specific behaviors at indicated points and intervals.** (Exercise 1.2.7, 1.6.9)
3. Given the graph of a function, answer questions about the function, its derivative, and its second derivative. (Exercises 1.3.1, 1.3.2, 1.3.3, 1.4.3, 1.4.4, 1.6.1, 1.6.2)
4. Use the limit definition to find the derivative function. (Exercises 1.4.2, 1.4.5)
5. Use the central difference and other estimation techniques to answer questions about applications of the derivative. (Exercises 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.6.8)
6. Given the graph of the derivative, answer questions about the function, the first derivative, and the second derivative. (Exercise 1.6.5, 1.6.7)
7. Given the graph of a function, determine the values of indicated limits. (Exercises 1.2.1, 1.2.2, 1.2.3, 1.7.1, 1.7.2)
8. **Given the graph of a function, determine the x-values where the function is not continuous and the points where it is not differentiable.** (Exercises 1.7.3, 1.7.5)
9. **Find a local linearization, use it to estimate the function at a nearby point, and answer questions about the accuracy of that estimate.** (Exercises 1.8.1, 1.8.2, 1.8.3, 1.8.4)
10. Find the equation of a tangent line. (Exercises 2.1.8, 2.2.2, 2.3.12b,2.4.5)
11. **Given information about two or more functions (either graphs or values, but not the equations), answer questions about new functions involving those functions and their derivatives.** (Exercises 2.1.10, 2.1.11. 2.3.8, 2.3.9, 2.3.12a,d, 2.5.5, 2.5.6, 2.6.5, 2.8.1)
12. Find dy/dx for a function given implicitly. (Exercises 2.1.1, 2.1.2, 2.1.3, 2.1.4, 2.1.5)
13. **USe L'Hopital's Rule to evaluate limits involving indeterminate forms.** (Exercises 2.8.3, 2.8.4, 2.8.5)
14. Find the intervals where a function is increasing/decreasing and identify the relative maximums and minimums of the function. (Exercises 3.1.1, 3.1.4)
15. Find the intervals where a function is concave up/down and identify the inflection points of the function. (Exercises 3.1.1, 3.1.2)
16. Use the second derivative test to identify the local maximums and minimums of a function.
17. **Given information about a function (but not its equation), answer question about the function, its first derivative, and its second derivative.** (Exercise 1.6.6, 3.1.5)
18. Given a family of functions, answer questions about the function and its derivative. (Exercises 3.2.3, 3.2.4)
19. Given a function and a closed interval, identify the absolute maximum and minimum on that interval. (Exercises 3.4.2, 3.4.4)
20. Solve an applied optimization problem. (Exercises 3.4.1, 3.4.2, 3.4.3, 3.4.4, 3.4.5)
21. Solve a related rates problem. (Exercises 3.5.1, 3.5.2, 3.5.3, 3.5.4, 3.5.5)
22. **Use anti-derivative to answer questions involving total distance traveled, change in position, velocity, and acceleration.** (Exercises 4.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5)
23. Use Riemann Sums to estimate the area between a positive function and the horizontal axis. (Exercises 4.2.1, 4.2.2, 4.2.3, 4.2.4)
24. Given a Riemann sum, identify the function and interval it is approximating to the area under the curve for. (Exercise 4.2.5)
25. **Use graphs of functions and properties of definite integrals to evaluate definite integrals.** (Exercises 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.6, 4.3.7)
26. **Use the fundamental theorem of calculus to evaluate definite integrals.** (Exercises 4.4.2, 4.4.3, 4.4.4, 4.4.5)
27. Given the graph of a function, answer questions about its anti-derivatives. (Exercises 5.1.1, 5.1.4, 5.1..5
28. Given the graph of a function, sketch a specified accumulation function of that function. (Exercises 5.1.3, 5.2.4)
29. Use the second fundamental theorem of calculus to determine the derivative of an accumulation function. (Exercise 5.2.2)
30. **Use substitution to evaluate definite and indefinite integrals.** (Exercises 5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6)

PLANNED COURSE SCHEDULE*

Date	Topic	Section in Active Calculus
Tuesday January 15	Course Introduction	
Thursday January 17	How do we measure velocity?	1.1
Friday January 18	How do we measure velocity? The notion of a limit	1.1 1.2
Monday January 21	The notion of a limit	1.2
Tuesday January 22	The derivative of a function at a point	1.3
Thursday January 24	The derivative of a function	1.4
Friday January 25	NO CLASS	
Monday January 28	Interpreting, Estimating, and using the derivative	1.5
Tuesday January 29	Interpreting, Estimating, and using the derivative The second derivative	1.5 1.6
Thursday January 31	The second derivative	1.6
Friday February 1	Limits, Continuity, and Differentiability	1.7
Monday February 4	The Tangent Line Approximation	1.8
Tuesday February 5	Catch Up / Review	
Thursday February 7	Exam 1	Learning Targets 1 - 9
Friday February 8	Elementary Derivative Rules	2.1
Monday February 11	Elementary Derivative Rules The sine and cosine functions	2.1 2.2
Tuesday February 12	The sine and cosine functions	2.2
Thursday February 14	The product and quotient rules	2.3
Friday February 15	NO CLASS – Reading Day	
Monday February 18	The product and quotient rules Derivatives of other trigonometric functions	2.3 2.4
Tuesday February 19	Derivatives of other trigonometric functions	2.4
Thursday February 21	The chain rule	2.5
Friday February 22	The chain rule Derivatives of Inverse Functions	2.5 2.6
Monday February 25	Derivatives of Inverse Functions	2.6
Tuesday February 26	Derivatives of Functions Given Implicitly	2.7
Thursday February 28	Derivatives of Functions Given Implicitly Using Derivatives to Evaluate Limits	2.7 2.8
Friday March 1	Using Derivatives to Evaluate Limits	2.8
Monday March 4	Derivative Practice	
Tuesday March 5	Catch Up / Review	
Thursday March 7	Exam 2	Learning Targets 1 – 13 Derivative Gateway Exam

Friday March 8	Using derivatives to identify extreme values	3.1
March 11 – March 18	NO CLASS – Spring Break	
Tuesday March 19	Using derivatives to identify extreme values	3.1
Thursday March 21	Using derivatives to describe families of functions	3.2
Friday March 22	Global Optimization	3.3
Monday March 25	Global Optimization	3.3
Tuesday March 26	Applied Optimization	3.4
Thursday March 28	Applied Optimization	3.4
Friday March 29	Related Rates	3.5
Monday April 1	Related Rates	3.5
Tuesday April 2	Catch Up / Review	
Thursday April 4	Exam 3	Learning Targets 10 – 21
Friday April 5	Determining distance traveled from velocity	4.1
Monday April 8	Determining distance traveled from velocity Riemann Sums	4.1 4.2
Tuesday April 9	Riemann Sums	4.2
Thursday April 11	The Definite Integral	4.3
Friday April 12	The Definite Integral The Fundamental Theorem of Calculus	4.3 4.4
Monday April 15	The Fundamental Theorem of Calculus	4.4
Tuesday April 16	Catch Up / Review	
Thursday April 18	Exam 4	Learning Targets 14 - 27
Friday April 19	Constructing Accurate Graphs of Antiderivatives	5.1
Monday April 22	Constructing Accurate Graphs of Antiderivatives The Second Fundamental Theorem of Calculus	5.1 5.2
Tuesday April 23	The Second Fundamental Theorem of Calculus	5.2
Thursday April 25	NO CLASS – Assessment Day / Ideafest	
Friday April 26	Integration By Substitution	5.3
Monday April 29	Integration By Substitution	5.3
Tuesday April 30	Catch Up / Review	
Thursday May 2	Exam 5	Learning Targets 22 - 30
Friday May 3	Final Exam Review	
Wednesday May 8	Final Exam 10:30am – 12:30pm	

*This schedule is tentative. I reserve the right to adjust the schedule if necessary to meet the needs of our learning community. I will give at least 24 hours advanced notice of any minor schedule changes (order/pace of topics) and I will give notice at least one week in advance of any major schedule changes (exam dates).