

**Syllabus**

**MATH 1131**

**Fall 2023**

### **Course Information**

**Course Name:** MATH 1131 V01 Calculus w/Analytic Geo 1

**CRN:**83283

**Instruction Mode:** Fully Online

**Course Duration:** August 14, 2023-Dec 05, 2023

**Credits:**4

### **Instructor Information**

**Instructor:** Dr. Ben Kamau

**Campus Office:** 311 LeNoir Hall

**Virtual Office Hours:** Wednesdays 4:00 pm-5:00 pm and F 11:00 am-12:00pm  
and by appointment

**Phone:** (706)-507-8246

**E-mail:** [kamau\\_ben@columbusstate.edu](mailto:kamau_ben@columbusstate.edu)

### **Textbooks and Learning Materials**

No purchase of Textbook is required for this course. This course utilizes material from Open Educational Resources.

All learning resources will be provided through CougarView (a CSU Learning Management System). Login into CougarView using MyCSU account.

#### **Suggested Textbooks**

**Title: Calculus Volume 1**

[Free Download](#)

Author: Edwin Herman, Gilbert Strang

Publisher: OpenStax

Hard Cover Book ISBN: 978-1-938168-02-4

**Title: Active Calculus**

[Read Online](#)

Author: Matthew Boelkins

## Other Resources

[WorkBook](#)

## Equipment and Course Access

### Computers

This is a fully online class, and access to a computer and internet is required. This course is supported by *CougarView*, which allow for access to all course materials and assessments. *CSU* email will be the primary means of communications regarding the course. *Microsoft Teams* will be used for setting up office hours meetings.

- **CougarView:** Provides access to Course syllabus, Topics Outline, Lecture PowerPoints, Assignments (Homework, Problem Sets, Project), Assessments (Quizzes, Midterm, Final Exams), Discussion forums and additional learning materials. Access CougarView login through the CSU main webpage.
- **Microsoft teams:** Will be used for office hours and any synchronous session.
- **CSU email:** Your CSU email address is where all official communication from CSU is sent. Please check your CSU email account periodically for important information. If I need to communicate with you via email, I will send the message to your CSU email account.

**Calculators:** You need to have a scientific calculator or a graphing calculator (e.g. TI 83, TI 84) for this course. Calculators with symbolic manipulation capabilities (such as the TI-89, TI-92 etc.) are not permitted during quizzes and exams.

**Technology:** Virtual Lab Activities will utilize [Geogebra](#) and/or [Desmos](#). Both are free online resources. You will need to create an account to access resources and lab activities posted. Basic use of Excel spreadsheets will be used in demonstrating and completing select assignments.

## Course Details

**Prerequisite:** MATH 1113 with a grade of "C" or better or an appropriate math placement score

**Course Topics:** Topics include exponential and logarithmic functions, introduction to limits and derivatives, computation and application of derivatives, and the definite integral.

**Credit Hours:** 4 semester hours baccalaureate credit.

### General Education Student Learning Outcomes

**Learning Goal A2:** Model and interpret quantitative problems from authentic contexts and everyday life situations.

**Learning Goal D2:** Effectively apply symbolic representations to model and solve problems.

**Student Learning Outcomes:** After successfully completing this course, the student will be able to:

- Understand the concepts of a limit of a function, the derivative, integrals
- Understand the Mean Value Theorem and the Fundamental Theorem of Calculus
- Be able to compute limits graphically and algebraically
- Be able to compute derivatives by the differentiation rules
- Be able to compute integrals by basic rules
- Know how to apply the derivative in problems involving optimization, curve sketching, approximations, physics, business, and economics

### Learning Objectives

Students who successfully complete this course should be able to;

- 1) Solve problems by analyzing a given graph and identifying behaviors of one variable as influenced by changes in the other variable; or a given equation and identifying fundamental characteristics of the corresponding graph.
- 2) Determine the limit of a function algebraically and graphically.
- 3) Find the derivative of a function algebraically from the limit definition.
- 4) Interpret the derivative as a rate of change.
- 5) Compute derivatives using the rules of differentiation.
- 6) Solve problems which require understanding the relationship position velocity-acceleration.
- 7) Use derivatives to compute linear approximation to functions.
- 8) Use L'Hospital rule to solve problems involving indeterminate forms of limits.
- 9) Use the relationship between a function and its derivative to solve problems involving analytic geometry and optimization.
- 10) Analyze certain inequalities/equations using the Mean Value Theorem.

- 11) Use the Fundamental Theorem of Calculus to compute definite integrals so, in particular, certain areas.
- 12) Compute integrals using the basic properties of integration.

**Course Format:** This course includes lectures, Lab activities, Class activities, Group work, discussions and Project.

## High Impact Practices

High Impact Practices element applied in this course include;

- Performance expectations set at appropriately high levels
- Frequent, timely, and constructive feedback
- Opportunities to discover relevance of learning through real-world applications
- Group Activities
- Dissemination
- Reflection and Integration

## Assessments

### Online Homework:

- a) Five Online homework will be assigned and completed in *CougarView*.
- b) There are total of two attempts. After the first attempt is complete, a second attempt on incorrect questions from the first attempt will be available.
- c) There are no extensions on the due dates for homework. Once the due date has passed, the homework will automatically close and cannot be accessed\*. The due dates for the homework assignments are clearly indicated in *CougarView* and listed below.

### Quizzes

- a) You will have 3 online timed quizzes through *CougarView*. Lockdown Browser (in *CougarView*) will be activated during quizzes and exams. You will need a one-time download of the Lockdown Browser before taking the first quiz. **Lockdown Browser is free, download using [this link](#).**
- b) Late quizzes (after the due date) will not be accepted; no make-up quizzes will be given (see *Missed Quizzes and Test policy* below).

### Problem Sets

Three Problem sets will be assigned and completed through *CougarView* under "Assessment" and "Assignment" tabs.

In the Problem sets, the student is expected to demonstrate understanding of concepts of Calculus. Further readings and regular practice will be necessary on the part of student to be able to solve the problems efficiently. Problem Sets require that you show all your work clearly for credit. Problem Sets with submitted answers only will not be graded. See due dates under Important dates listed below.

### **Project**

A group project will be assigned and completed through CougarView under "Assessment" and "Assignment" tabs.

In the Project, the student is expected to demonstrate applications of concepts of Calculus. Project will cover application of derivative in problems involving optimization. Further readings and regular practice will be necessary on the part of student to be able to solve the problems efficiently and present their solutions to peers. Presentation of the Project groupwork is required at the end of the semester (see due dates under Important dates listed below).

### **Midterm Exam and Final Exam**

A Midterm and a final exam will be given during the semester. Midterm and Final Exam will be proctored. To take the exams the student will need a computer equipped with webcam to facilitate proctoring services during exams. There is a fee associated with Proctoring Services. Proctoring information and instructions will be provided in advance during the semester.

## **Course Evaluation Process**

All graded assessments in this course will be completed in *CourgaView*. Course grades are based on the following assessments;

- 5 Online Homework contributing 25% of the course average
- 3 Quizzes contributing 15% of the course average
- 3 Problem Sets contributing 15% of the course average
- Project contributing 10% of the course average
- Midterm Exam contributing 15% of course average
- Comprehensive Final Exam contributing 20% of course average.

**Note:** Lab and Group Activities are assigned to help student better understanding of the concepts and no grade associated with these activities directly.

The final course grades will be assigned based on the standard scale below

**A:** 90%-100%; **B:** 80%-89%; **C:** 70%-79%; **D:** 60%-69%; **F:** Below 60%.

### **Important Test dates**

**Review Homework:** Due 8/20/2023

**Homework 1:** Due 8/27/2023

**Quiz 1:** Due 9/3/2023

**Problem Set 1:** Due 9/10/2023

**Homework 2:** Due 9/17/2023

**Quiz 2:** Due 9/26/2023

**Midterm:** Due October 6, 2023

**Problem set 2:** Due 10/15/2023

**Homework 3\*:** Due 10/22/2023

**Quiz 3:** Due 10/29/2023

**Homework 4:** Due 11/12/2023

**Project:** Due November 13, 2023

**Problem Set 3:** Due 11/19/2023

**Final Exam:** November 29, 2023

### **Attendance and Exam Policy**

**Missed Quizzes and Exams policy:** No make-ups for missed Quizzes or Exams. In case a student misses midterm exam for a legitimate reason such as illness, emergency, etc. and with instructor approval, the weight of the student's final exam will be adjusted to compensate for the missing midterm score. In case a student misses a quiz (in CougarView) for a legitimate reason such as illness, emergency, etc. and with instructor approval, the weight of the student's next exam will be adjusted to compensate for the missing quiz score. Only ONE missed quiz will be eligible for such consideration.

For a student who misses quiz or exam without a legitimate reason, a score of zero will be entered for the missed quiz or exam.

**Final Exam:** The final exam is comprehensive and is an integral part of the course. No student will be exempt from taking the final exam. For any student who misses the final exam, an "F" grade will be assigned for the course.

**Re-grade Policy:** You have up to one week after the Quiz, Problem set or Midterm score are posted to request regrading.

**Attendance:** Accessing of course material in *CougarView*, completion of assigned work, homework, taking quizzes, exams and project are requirement to remain in enrolled in this class. Students who fail to access course material in *CougarView* or fail to complete two-weeks' worth of assigned work or testing will be dropped from the course for non-attendance.

**Other Important dates and procedures:** See important semester dates in the University academic calendar, under Fall (Regular Term)

<https://www.columbusstate.edu/academics/calendars/2023-2024.php>

The student is responsible for completing the withdrawal request and submitting it to the Registrar's Office. For Drop/Add procedures see

<https://www.columbusstate.edu/registrar/drop-add.php>

## **Academic Dishonesty/Misconduct Policy**

Please refer to CSU [Academic Dishonesty/Misconduct Policy](#) for details.

**Academic Misconduct:** Any student caught cheating or committing plagiarism will be subject to disciplinary action. In this course, disciplinary actions will include assignment of an "F" for the course grade, and further actions consistent with the policies of the university.

**Behavioral Misconduct:** Will not be tolerated and will be dealt with in accordance to Student and Faculty handbooks.

Please review the student handbook for further details.

*"5. Disorderly Conduct*

*a. Behavior that disrupts the academic pursuits, substantially injures the academic reputation, or infringes upon the privacy, rights, or privileges of other persons is prohibited.*

*f. No person shall interfere with, or fail to cooperate with, any properly identified university faculty or staff personnel while these persons are in the performance of their duties."* Columbus State University Student Handbook, 2008 – 2009, p. 66.

Penalty: In this course, the penalty for behavioral misconduct is withdrawal from the course.

## **Resources for Students**

### **Students with Disabilities:**

If you have a documented disability as described by the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, Section 504, you may

be eligible to receive accommodations to assist in programmatic and/or physical accessibility. We recommend that you contact the Office of Disability Services located in Schuster Student Success Center, room 221, [706-507-8755](tel:706-507-8755) as soon as possible. The Office of Disability Services can assist you in formulating a reasonable accommodation plan and in providing support. Course requirements will not be waived but accommodations may be able to assist you to meet the requirements. Technical support may also be available to meet your specific need. "Students with documented physical, psychological, or cognitive disabilities should contact the Office of Disability Services as early as possible."  
<https://disability.columbusstate.edu/index.php>.

### **Emotional and Mental Health STATEMENT:**

Your emotional and mental health is very important and can affect your ability to meet your academic responsibility. Part- and full-time students have free access to mental health counseling through the CSU [Counseling Center](#). If you begin to experience any sort of emotional concerns such as anxiety, depression, or significant life events that are negatively impacting you, please seek help at the counseling center as quickly as possible. Please know that you will find a friendly "virtual" face for your appointments. Hours of operation are 8:00AM to 8:00PM Monday and Tuesday and 8:00AM to 5:00PM Wednesday through Friday. You can call to set up an appointment: 706-507-8740. If you are in crisis during non-business hours, please call the Georgia Crisis Line: 1-800-715-4225.

### **Title IX Discrimination**

Under Title IX of the Education Amendments of 1972, harassment based on sex, including non-consensual sexual contact, stalking, sexual exploitation, domestic and dating violence, and harassment because of pregnancy or related conditions, is prohibited. If a student would like to file a complaint for Title IX discrimination or has any questions, please contact the CSU Title IX Coordinator (Lauren A. Jones, J.D. 4225 University Avenue, Schuster 221, Columbus, GA 31907, [jones\\_lauren3@columbusstate.edu](mailto:jones_lauren3@columbusstate.edu), 706.507.8757) and/or the Office of Civil Rights (Atlanta Office, U.S. Department of Education, 61 Forsyth Street S.W., Suite 19T10, Atlanta, GA 30303-8927, 404.974.9406, [OCR.Atlanta@ed.gov](mailto:OCR.Atlanta@ed.gov)).

### **Academic Center for Tutoring**

The ACT at CSU offers free tutoring for all enrolled CSU students in a variety of courses as well as in writing and resume/cover letter preparation. Tutoring is available online or face to face in Simon Schwob Memorial Library on the Second Floor. An appointment is required. Check our website for hours of availability and more information: <https://act.columbusstate.edu/> . If you have questions you can email [act@columbusstate.edu](mailto:act@columbusstate.edu) or call 706-507-8646.



For more information on the services the ACT provides for faculty please visit: <https://act.columbusstate.edu/resources-faculty.php>

## **CSU Advise**

ADVISE serves as CSU's central resource for information regarding academic programs, student support services, and other campus opportunities. Visit <https://www.columbusstate.edu/csu-advise/>

## **HOUSE BILL 280**

Whether a fully online, blended classroom, or on-ground classroom student, you should become familiar with "campus carry" legislation. For information regarding HB 280 (Campus Carry), please refer to [House Bill 280](#). It is the permit holder's responsibility to know and comply with the law.

## **STUDENT RIGHTS AND RESPONSIBILITIES**

Information regarding student rights and responsibilities can be found in the [CSU Student Handbook](#).

## Tentative Schedule

\*Tentative Schedule (subject to change on as-needed basis) Fall 2023

Week	Date	Section Covered	Activity
1	8/20	<p><b>Introduction, Syllabus,</b></p> <p><b>R1: Review of Sets and Functions</b></p> <p>R1.1 Definitions of sets (belong, notation, Set-Builder notation, Sets of Numbers)</p> <p>R1.2 Definition of Functions, domain and range</p> <p>R1.3 Functions</p> <ul style="list-style-type: none"> <li>• Four ways of representing functions, domain and/or range <ul style="list-style-type: none"> <li>▪ Verbally (description in words)</li> <li>▪ Numerically (Table of Values)</li> <li>▪ Visually (Graph)</li> <li>▪ Algebraically (Explicit formula)</li> </ul> </li> <li>• Graphs of functions and Vertical line test</li> <li>• Piecewise defined functions</li> <li>• Increasing and Decreasing</li> <li>• Symmetry</li> </ul> <p><b>R 2: Classes of Essential Functions</b></p> <p>Linear functions, Polynomials, Power functions, Rational Functions, Algebraic functions. Trigonometric Functions, Inverse Functions, Exponential and Logarithmic Functions</p> <p><b>R 3: Combinations of Functions</b></p> <p>R3.1 Transformation of functions</p> <p>R3.2 Algebra of functions</p> <p>R3.3 Composition of Functions</p>	<p><b>HW-R(8/20/2023)</b></p>
2		<p><b>1.1 A Preview of Calculus</b></p> <p>1.1.1 Tangent problem (Explain how the idea of a limit is involved in solving the tangent problem, Recognize a tangent to a curve at a point as the limit of secant lines)</p> <p>1.1.2 Average velocity and Instantaneous velocity</p>	<p>Advance Organizer</p> <p>Lab</p>

		<p>(Identify instantaneous velocity as the limit of average velocity over a small time interval.)</p> <p><b>1.2 The Limit of a function</b></p> <p>1.2.1 Example of finding limits (using table and graph)</p> <p>1.2.2 Formal definition of limits (at a point, one-sided, existence of limit)</p> <p>1.2.3 Infinite limits and limits at infinity</p> <p>1.2.4 Limits of Piecewise defined functions (from graphs)</p> <p><b>1.3 The Limit Laws</b></p> <p>1.3.1 Limit laws (with examples)</p> <p>1.3.2 Evaluating limits using limit laws</p> <p>1.3.3 Criteria for existence of limits, monotonicity of limit, squeeze theorem</p>	<p>Activity (Desmos or Geogebra) Secant line and Tangent line</p> <p><b>H/W 1</b> (8/27/2023)</p>
3	9/3	<p><b>1.4 Continuity</b></p> <p>1.4.1 Three conditions for continuity at a point.</p> <p>1.4.2 Three kinds of discontinuities.</p> <p>1.4.3 Continuity on an interval.</p> <p>1.4.4 Continuity of functions in their domain (polynomial, rational, root, trigonometric, exponential and logarithmic)</p> <p>1.4.5 Limits of composite functions</p> <p>1.4.6 The Intermediate Value Theorem (IVT)</p> <p><b>2.1 Defining the Derivative</b></p> <p>2.1.1 Average rate of change</p> <p>2.1.2 The instantaneous rate of change as a limit of average rate of change.</p> <p>2.1.3 Derivative as the limit of a difference quotient.</p> <p>2.1.4 Derivative of a given function at a point</p> <p>2.1.5 Existence of derivatives</p>	<p><b>Quiz 1(9/3/2023)</b></p>
4		<p><b>2.2 The Derivative as a Function</b></p> <p>2.2.1 Define the derivative function of a given function.</p> <p>2.2.2 Graph a derivative function from the graph of a</p>	<p>Geogebra Activity</p> <p><b>Problem Set</b></p>

		<p>given function.</p> <p>2.2.3 Derivatives and continuity. Describe three conditions for when a function does not have a derivative.</p> <p>2.2.4 Higher-order derivatives</p>	<b>1(9/10/2023)</b>
5		<p><b>2.3 Differentiation Rules</b></p> <p>2.3.1 Apply Constant, constant multiple, and power rules.</p> <p>2.3.2 Apply the sum and difference rules.</p> <p>2.3.3 Use the product rule</p> <p>2.3.4 Use the quotient rule</p> <p>2.3.5 Derivatives of a polynomial or rational function</p>	<b>H/W 2(9/17/2023)</b>
6		<p><b>2.4 Derivatives of Trigonometric Functions</b></p> <p>2.4.1 Derivatives of the sine and cosine function.</p> <p>2.4.2 Derivatives of the standard trigonometric functions.</p> <p>2.4.3 Higher-order derivatives of the sine and cosine</p>	<b>Quiz 2 (9/26/2023)</b>
7		<p><b>2.5 The Chain Rule and the Generalized Power rule</b></p> <p>2.5.1 Chain rule</p> <p>2.5.2 Chain rule together with the power rule.</p>	

8		<b>2.6 Implicit Differentiation</b>  <b>2.7 Derivative of Inverse Functions</b>  <b>2.8 Derivatives of Exponential and Logarithmic Functions</b> 2.8.1 Derivatives of exponential functions.  2.8.2 Derivatives of logarithmic functions.  2.8.3 Logarithmic differentiation	<b>Midterm Exam (10/6/2023)</b>
9		<b>3.1 Related Rates</b>  3.1.1 Express changing quantities in terms of derivatives.  3.1.2 Problem Solving Strategy: Solving Rates Related Problems  <b>3.3 Maxima and Minima</b>  3.3.1 Define absolute extrema.  3.3.2 Define local extrema.  3.3.3 Critical points of a function over a closed interval.  3.3.4 The Closed interval Method	<b>Problem set 2(10/15/2023)</b>
10		<b>3.4 The Mean Value Theorem</b>  3.4.1 Rolle's theorem.  3.4.2 Mean Value Theorem.  3.4.3 Consequences of the Mean Value Theorem.	

		<b>3.5 Derivatives and the Shape of a Graph</b>  3.5.1 How derivatives affect the shape of a function's graph.  3.5.2 First derivative test  3.5.3 Concavity and inflection points  3.5.4 Second derivative test	<b>H/W 3 (10/22/2023)</b>
11		<b>3.6 Applied Optimization Problems</b>  3.6.1 Set up  3.6.2 Problem Solving Strategy: Solving Optimization Problems  3.6.3 Solve optimization problems in several applied fields	<b>Quiz 3 (10/29/2023)</b>  Project Assigned
12		<b>3.7 Indeterminate forms and L'Hôpital's Rule</b>  3.7.1 Recognize when to apply L'Hôpital's rule  3.7.2 Identify indeterminate forms produced by quotients, products, subtractions, and powers, and apply L'Hôpital's rule in each case  <b>3.8 Antiderivatives</b> 3.8.1 General antiderivative of a given function.	
13		<b>4.1 Approximating Areas</b>  4.1.1 Sigma (summation) notation to calculate sums and powers of integers.	(Geogebra or

		<p>4.1.2 Sum of rectangular areas to approximate the area under a curve.</p> <p>4.1.3 Riemann sums to approximate area.</p> <p><b>4.2 The Definite Integral</b></p> <p>4.2.1 Definition of the definite integral.</p> <p>4.2.2 Properties of the definite integral</p> <p>4.2.3 Comparison Properties of Integrals</p> <p>4.2.4 Definite integral and net area</p>	<p>Desmos Activity).</p> <p><b>HW 4 (11/12/2023)</b></p>
14		<p><b>4.3 The Fundamental Theorem of Calculus</b></p> <p>4.3.1 Mean Value Theorem for Integrals.</p> <p>4.3.2 Fundamental Theorem of Calculus, Part 1.</p> <p>4.3.3 Fundamental Theorem of Calculus, Part 2.</p> <p><b>4.4 Integration Formulas and the Net Change Theorem</b></p> <p>4.4.1 Basic integration formulas</p> <p>4.4.2 Net change theorem</p>	<p><b>Project (11/13/2023)</b></p> <p><b>Problem Set 3 (11/19/2023)</b></p>
15		<p><b>4.5 Substitution</b></p> <p><b>Final Exam Week</b></p>	<p><b>Final Exam (11/29/2023)</b></p>

