MATH-2231-002: SYLLABUS

1. Course Information

- Course Title: CALCULUS AND ANALYTIC GEOMETRY I
- Course Number: 2231
- Credit Hours: 5; Clinical Hours: 0; Lecture Hours: 5; Lab Hours: 0
- Meet Times: Monday, Tuesday, Wednesday, Thursday and Friday from 1030 to 1245
- Meet Location: BIC 3525
- Course Description: This is the first calculus course for students majoring in science, technology, engineering, and mathematics. Topics include lines, circles, functions, limits, continuity, the derivative, rules for differentiation of algebraic, trigonometric, and the transcendental functions, related rates, mean value theorem, optimization and curve sketching, differentials, Newton's method, antiderivatives and integration, and the fundamental theorem of calculus.
- Prerequisite: MATH 1431 and MATH 1432 or college equivalents, both with a grade of C or better or a qualifying score on the mathematics placement test.

2. Instructor Information

- Name: Michael McCabe, M.S.
- Email: mccabem85@cod.edu
- Office: 3436B
- Office Phone: 630 942 2152

- Office Hours: Labeled on Blackboard (always available by appointment)

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3. General Course Objectives

Upon successful completion of the course the student should be able to do the following:

1 Use the definition of the limit of a function

2 Evaluate limits graphically, numerically, and algebraically

3 Evaluate one-sided limits

4 Determine the continuity of a function at a point and over an interval

5 Find the derivative of a function using the limit definition

6 Determine the differentiability of a function at a point and over an interval

7 Use the intermediate value theorem

8 Use the rules of differentiation to find the derivative of a function (including the product, quotient, and chain rules)

9 Differentiate implicitly

10 Use derivatives in geometry and other applications that involve rates of change

11 Determine higher order derivatives, with applications to linear motion

12 Determine the differential of a function and use it in error analysis

13 Find the location and type of all relative and absolute extrema of a function by using its first and second derivatives

14 Use derivatives to determine where a function is increasing, where it is decreasing, where its graph is concave upward, and where its graph is concave downward

15 Use the extreme value theorem

16 Use Rolle's theorem and the mean value theorem

17 Determine the limit of a function at infinity

18 Use L'Hopital's rule to evaluate limits for indeterminate forms

19 Evaluate limits having indeterminate forms

20 Compare and contrast relative rates of growth

21 Locate all (if any) vertical, horizontal, and slant asymptotes on the graph of a function

22 Construct the graph of a function by locating all intercepts, asymptotes, and relative extrema points, and by determining concavity over the domain of the function

23 Solve optimization problems including applications

24 Determine the approximate zeros of a function using Newton's Method

25 Solve related rate problems including applications

26 Determine the antiderivative of a function

27 Solve a separable differential equation and an initial value problem

28 Estimate a definite integral using a Riemann sum

29 Evaluate a definite integral by taking the limit of a Riemann sum

30 Use the fundamental theorem of calculus to evaluate a definite integral

31 Use substitution to determine definite and indefinite integrals

32 Use the properties of definite and indefinite integrals

33 Determine the mean value of a continuous function over a closed interval

34 Define the exponential and logarithmic functions

35 Graph the exponential and logarithmic functions

36 Simplify expressions using properties of logarithms

37 Differentiate logarithmic and exponential functions, including bases other than e

38 Integrate logarithmic and exponential functions, including bases other than e

39 Apply logarithmic differentiation

40 Evaluate integrals that result in logarithmic functions

41 Evaluate expressions involving inverse trigonometric functions

42 Differentiate expressions involving inverse trigonometric functions and trigonometric functions

4. Topical Outline

1.: Review
- **a.:** Straight lines and circles
- **b.:** Functions and their graphs
- **c.:** Symmetry ii. Domain and range iii. Interval notation iv. Special functions
- **d.:** Absolute value
- **e.:** Polynomial
- **f.:** Rational

- **g.:** The greatest-integer function
- **h.:** Logarithmic and exponential functions
- **i.:** Trigonometry
- **j.:** Special angles and radian measure ii. Trigonometric identities iii. Inverse trigonometric functions

2.: Limits and continuity
- **a.:** Limits
- **b.:** Numerical and graphical approach to limits ii. Definition and proof using epsilon and delta iii. Limit theorems and techniques for evaluation of limits iv. One-sided limits
- **c.:** Infinite limits vi. Trigonometric limits
- **d.:** Continuity
- **e.:** Definition ii. Properties
- **f.:** The intermediate value theorem

3.: The derivative
- **a.:** Definition
- **b.:** Derivative as a slope of tangent line ii. Derivative as instantaneous rate of change iii. Velocity and acceleration in linear motion
- **c.:** Formulas for finding derivatives
- **d.:** Sum, difference, product, and quotient rules ii. Power rule and chain rule iii. Sine, cosine, tangent, cosecant, secant, and cotangent iv. Logarithmic and exponential functions
- **e.:** Implicit differentiation
- **f.:** Logarithmic differentiation
- **g.:** Higher order derivatives
- **h.:** Derivatives and continuity

4.: Application of the derivative
- **a.:** Related rates
- **b.:** Maxima and minima
- **c.:** Extreme value theorem ii. Rolle's theorem iii. Mean value theorem iv. Test for increasing and decreasing functions
- **d.:** First derivative test and second derivative test vi. Concavity and points of inflection vii. Applications
- **e.:** Limits at infinity
- **f.:** L'Hopital's Rule
- **g.:** Asymptotes
- **h.:** Newton's method
- **i.:** Business applications (optional)
- **j.:** Differentials

5.: Definite and indefinite integrals
- **a.:** Antiderivatives and the indefinite integral
- **b.:** Integration by substitution
- **c.:** Sigma notation and Riemann sums
- **d.:** The definite integral and area
- **e.:** The fundamental theorem of calculus
- **f.:** The properties of the definite integral
- **g.:** Definite integrals with substitution
- **h.:** Mean value theorem for integrals

6.: Transcendental functions
- **a.:** Logarithmic and exponential functions
- **b.:** Integration ii. Bases e, 10, and other
- **c.:** Inverse trigonometric functions and their derivatives

5. Required Texts, Materials, and Supplies

- **Required Text**: Thomas' Calculus: Early Transcendentals, 15th edition
- **Materials**: Notebook for taking notes in class, writing tools, and if possible a internet enabled device.
- **Supplies**: Internet, extra notebooks, and extra writing tools

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6. Schedule

6.1. Academic Calendar.

- First Day: 06/10/2024
- No Class: 06/19/2024 and 07/04/2024
- Last Day to Withdraw: 07/20/2024
- Final Exam: Thursday, August 1st from 1030 to 1245

6.2. Exam Dates (Tentative).

- Exam 1: 06/20/2024
- Exam 2: 07/03/2024
- Exam 3: 07/18/2024

6.3. Content Coverage.

- Week 1 chapter 2
- Week 2 up to derivative rules for trig functions
- Week 3 up to related rate problems
- Week 4 short week wrap things up and take an exam
- Week 5 up to optimization problems
- Week 6 antiderivatives and area under curves
- Week 7 Fundamental Theorem of Calculus
- Week 8 transcendental functions and their integrals

7. Method of Evaluation

(1) Exams [Weight 35%]
   (a) No drops and no retakes.
(2) Quizzes [Weight 35%]
   (a) At least 3 drops and no retake
(3) Homework Sets [Weight 10%]
   (a) At least three of the lowest scores will be dropped.
(4) Final Exam [Weight 20%]
   (a) Test on everything covered throughout the semester (Cumulative Exam).
   (b) Constructed to be completed during a 2 hour time limit on the scheduled Final Exam day.
   (c) I plan to construct the Final Exam similar to twice the amount of a regular exam.

7.1. **Grade Scale.**

A: 90% to 100%
B: 80% to 89%
C: 70% to 79%
D: 60% to 69%
F: 59% or less

I do round.

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8. Ultra Course View Pilot

Welcome to Math 1431! This course is part of a pilot program for Blackboard Ultra Course View, a user-friendly learning management system designed to enhance your online learning experience. You may engage with various newly available tools and features within the platform to access course materials, participate in discussions, submit assignments, and receive feedback. This pilot of Blackboard Ultra does not change course credits or the instructor established grading basis and course requirements.

Throughout the term, you may be asked to provide feedback through anonymous course surveys. Please be as candid as possible as this is an opportunity for both instructors and students to explore and provide feedback on the Blackboard Ultra Course View experience.

If you, at any time, experience any difficulties using the Ultra Course View, the College has technical support available just for you. Please send us an email at studentultrahelp@cod.edu. Staff are available during traditional business hours (8am – 5pm) and we will get back to you as soon as possible. For on-demand help, please use Blackboard Learn Help for Students –{} Ultra Course View.

9. Academic Honesty

As members of the College of DuPage community, we share a commitment to the highest standards of learning and ethical behavior. The College and its faculty strive to build meaningful and productive relationships with our students. The expectation of honesty and effort is the foundation of that relationship. Academic dishonesty damages the learning partnership built between student and faculty and is considered a serious breach of the principles of learning and growth. Violations of the Code of Academic Conduct will be dealt with appropriately and may become part of a student's educational record. Please don't risk it! For further information about the expectations, please review the Code of Academic Conduct found at the following website: Code of Academic Conduct.

10. Access and Accommodations

- As a course policy, I do not accept late work/make up for My Open Math assignments, attendance, and participation. I am committed to providing fair, equal, and unbiased accommodations. If you believe that your circumstances qualify you for accommodations, please contact the Center for Access and Accommodations at access@cod.edu. Staff from the Center can help you better understand if your situation qualifies you for an accommodation.

- If you are student who is registered with the Center for Access and Accommodations, please send me your Letter of Accommodation as soon as possible.
- Please do not send me personal medical records or similar personal documents.
- Here is a to start the process for accommodations: Center for Access and Accommodations Intake Form (https://cod-accommodate.symplicity.com/public_accommodation/).

The College of DuPage is committed to the equitable access of educational opportunities for students with disabilities in accordance with The Americans with Disabilities Act, As Amended and Section 504 of the Rehabilitation Act of 1973. Any student who feels they may need an accommodation on the basis of an illness, injury, medical condition, or disability should contact the Center for Access and Accommodations to determine eligibility for accommodations and to obtain an official Letter of Accommodation. The Center for Access and Accommodations can be reached via email at access@cod.edu. Students may also initiate a request for services by going to www.cod.edu/access and clicking on the green box labeled "complete form to request accommodations." If you are already registered with the Center for Access and Accommodations, please email me your Letter of Accommodation as soon as possible. Please DO NOT send any private health documentation or Doctor's notes to me.

11. Withdraw Policy

Withdrawal from a Class. The final day for a student to withdraw from any course will be equal to 75% of the time for the respective academic session (see the Registration Calendar) through MyAccess or in person at the Registration office, Student Services Center (SSC), Room 2221.

Administrative Withdrawal. After the deadline, students will be required to appeal for late withdrawal and provide appropriate documentation to the Student Registration Services Office for all requests. Students who are granted approval to withdraw by petition will not be eligible for refunds of tuition or fees and will receive a 'W' grade on their transcript. Appeals must be submitted prior to the designated final exam period for 16-week classes and before the last class meeting for all other session classes.

Coronavirus Information. Stay up to date with information provided by the college about alternative withdrawal policies. Coronavirus Information