Quinsigamond Community College School of Math, Science, & Engineering

Instructor's Information

Instructor:Professor XX (she/her/hers)Office:200AEmail:xxxx@qcc.mass.eduTelephone:508-854-xxxx

Course Information

Course:	MAT 233 Calculus I – Section XX
Meets:	Tuesdays and Thursdays from 8:00am – 9:40am
Room:	175A
Credits:	4 credits
Semester:	Fall 2024

Course Description

This course begins with a review of functions and functional notation. After introducing the limit and continuity theorems on an intuitive basis, the study of differentiation begins. Typical derivative formulae are applied to polynomial, rational, trigonometric, implicit, logarithmic, exponential, and inverse trigonometric functions. Application topics include extrema, related rates, curve sketching, and velocity and acceleration. The basic rules of integration and the substitution method are introduced along with Riemann Sums and the Fundamental Theorem of Calculus.

Prerequisites

MAT 124 Trigonometry or appropriate placement score

Required Textbook/Materials/Website

 Textbook: Calculus: Early Transcendentals, by Briggs, 3rd edition, Pearson © 2019
Materials: Graphing calculator (recommended)
Website: Access to Pearson's MyLab Math; choose one (1) of the following: MyMathLab 18-week Access Standalone Code for Calculus (if only taking Calc I) or MyMathLab 24-month Access Standalone Code for Calculus (if also taking Calc II & III)

Student Learning Outcomes

Upon completion of this course, students will be able to:

- 1. Use graphical and algebraic methods to evaluate limits.
- 2. Compute derivative of a function.
- 3. Apply the derivative in problems dealing with motion, related rates, implicit differentiation, finding extrema, graphing, optimization and L'Hôpital's Rule.

4. Compute antiderivatives and solve definite integrals using the Fundamental Theorem of Calculus.

Course Topics & Required Section Readings/Assignments

<u>Limits</u>

- The Idea of Limits
- Definitions of Limits
- Techniques for Computing Limits
- Infinite Limits
- Limits at Infinity
- Continuity
- Precise Definitions of Limits

Derivatives

- Introducing the Derivative
- Rules of Differentiation
- The Product and Quotient Rules
- Derivatives of Trigonometric Functions
- Derivatives as Rates of Change
- The Chain Rule
- Implicit Differentiation
- Derivatives of Logarithmic and Exponential Functions
- Derivatives of Inverse Trigonometric Functions
- Related Rates

Applications of the Derivative

- Maxima and Minima
- Mean Value Theorem
- What Derivatives Tell Us
- Graphing Functions
- Optimization Problems
- L'Hôpital's Rule
- Antiderivatives

Integration

- Approximating Areas under Curves
- Definite Integrals
- Fundamental Theorem of Calculus
- Working with Integrals
- Substitution Rule

Instructional Objectives

- Define inverse, exponential, logarithmic, and inverse trigonometric functions.
- Use inductive and deductive reasoning.
- Evaluate the limits of a function as x approaches a point using numerical, graphical and analytical strategies.

- Evaluate the limits of a function as *x* approaches positive or negative infinity using numerical, graphical and analytical strategies.
- Calculate one-sided limits.
- Define continuity.
- Test a function for continuity.
- Identify values for *x* for which a function is discontinuous.
- Categorize a discontinuity as removable or singular.
- State the Intermediate Value Theorem and use it to prove the existence of roots of polynomials.
- Compute the derivative using the limit definition and the difference-quotient rule.
- Write the equation of the tangent line to a curve at a particular point.
- Discuss the connection between continuity and differentiability.
- Differentiate constant, polynomial functions as well as the sum & differences of functions.
- Define and correctly use the product and quotient rules.
- Differentiate trigonometric functions.
- Compute higher derivatives.
- Determine average and instantaneous velocity.
- Define instantaneous velocity as the first derivative of the position function.
- Define acceleration as the second derivative of the position function.
- Solve appropriate word problems using position, velocity and acceleration and their respective derivatives.
- Correctly recognize situations where the chain rule should be used and apply the rule correctly.
- Implicitly differentiate functions.
- Differentiate logarithmic and exponential functions.
- Differentiate inverse trigonometric functions.
- Differentiate inverse functions in general.
- Set up and solve equations involving related rate application problems.
- Define and identify where functions are increasing and decreasing using the first derivative test.
- Determine the local maxima and minima of a function using the first derivative test.
- Identify the absolute maximum and minimum of a function if they exist.
- Define and identify when functions are concave up and concave down using the second derivative test.
- Identify the inflection points of a function.
- Using information obtained from the first and second derivative tests, sketch the graph of a function.
- Set up and solve equations involving optimization application problems.
- Calculate limits using L'Hôpital's rule.
- State and apply Rolle's Theorem.
- State and apply the Mean Value Theorem.
- Calculate differentials and use them to compute error propagation.
- Use basic integration rules to find antiderivatives (power rule, trigonometric functions, exponential, logarithmic, inverse trigonometric functions).
- Use sigma notation to write and evaluate a sum.
- Understand the definition of a Riemann sum.

- Evaluate a definite integral using the Fundamental Theorem of Calculus.
- Employ the Second Fundamental Theorem of Calculus correctly using dummy variables.
- Compute definite and indefinite integrals using the Substitution Method.

Grading Breakdown

- 20% Homework
- 10% Quizzes
- 10% <Attendance>
- 35% Exams
- 25% Comprehensive Final Exam

Grade	Range	Grade	Range	Grade	Range
А	95 – 100	В —	80 - 82	D +	67 – 69
A –	90 – 94	C +	77 – 79	D	63 – 66
B +	87 – 89	С	73 – 76	D –	60 - 62
В	83 – 86	C –	70 – 72	F	0 – 59

Teaching Procedures

Most classes will be a combination of lectures, group activities, and in-class assignments. You will be given homework assignments to be completed outside of class. Occasionally, a quiz or exam will be given in class.

Attendance Policy

Students are expected to attend all classes for the entire period. Attendance will be taken in every class. If you are absent from class, proper documentation will excuse your absence.

Diversity, Equity, and Inclusion Statement for the School of Math & Science

The School of Math and Science is motivated to teach and learn from the diverse community we have at QCC. In Science, Technology, Engineering, and Mathematics (STEM), it is advantageous to approach problems from multiple perspectives. The power of diversity, equity and inclusion allows us to persevere and overcome challenges.

The faculty of the School of Math and Science pledge to help students meet the demands of STEM regardless of race/ethnicity, gender identity and expression, sexual orientation, faith, abilities/disabilities, age, socioeconomic background, political leaning, ancestry, national origin, home language and all other identities. We are dedicated to nurturing a culture of collaboration, mutual respect and understanding; and to empowering members of our community to embrace their full potential.

Accessibility Statement

Quinsigamond Community College is committed to providing access and inclusion for all persons with disabilities. Students who require an accommodation in this course should notify the professor as soon as possible. Students are responsible for forwarding the Accommodation Letter to the professor (via email or hard copy). Students may request accommodations at any time during the semester, which begin upon receipt (accommodations are not retroactive).

Please discuss any barriers which may arise during the semester with your professor or coordinator in the Student Accessibility Services office.

Contact Information for Student Accessibility Services (SAS):

Call: 508-854-4471 Sorenson Video Phone: 508-502-7647 Email: <u>disabilityservices@qcc.mass.edu</u>

Services for Veterans

If you are a veteran of the US Armed Forces, please visit the Veteran Affairs Office located in 258A (Administration Building) or contact them at <u>veteranaffairs@qcc.mass.edu</u>.

Academic Honesty and Plagiarism

Our purpose of education is to seek the truth; this work requires trust and honesty between teacher and student. If we are not honest about what we know and don't know, our learning will always be impaired. Because our teaching and learning depends on this honest communication, we expect all students to understand what plagiarism is and why it is unacceptable.

Plagiarism means taking someone else's ideas or words and presenting them as one's own. The offense can take many forms including cheating on a test, passing in a paper taken from the Internet or from another student, or failing to properly use and credit sources in an essay. Sometimes the issue is subtle, involving getting too much help on an assignment from someone else. In every instance, plagiarism means cheating both oneself and the owner of the source. Since cheating sabotages a student's learning experience, consequences range from no credit for the assignment to failure for the course and possible expulsion from the college.

The penalty for getting caught cheating in this course is a failure of the quiz or test, or failure of the entire course. This is solely at the discretion of the instructor.

For further information concerning plagiarism, refer to the QCC Student Handbook.

Math Center & QCC Math YouTube Channel

The Math Center provides free, drop-in tutoring assistance for students in any QCC mathematics course. Located on the second floor of the Harrington Learning Center (HLC), the Math Center is a welcoming place where students have the opportunity to work collaboratively with tutors and classmates. Students can work intensively to improve their mathematical skills or simply drop by to ask a few questions. In addition to tutoring, the Math Center houses various math-related resources, and computers and software for math coursework. Visit their website for details and the semester schedule: <u>https://www.qcc.edu/services/tutoring/math-center</u>

For further help, visit the QCC Math YouTube channel. This channel has a playlist specifically for this course, with many short videos created with students like you in mind, covering many of the topics in this course: <u>https://www.youtube.com/user/QCCmath</u>

Assignment & Test Schedule <list all assignments, quizzes, and exam dates>