



**Course Outline for MAT 263
BRIEF CALCULUS**

I. CATALOG DESCRIPTION:

MAT 263 – Brief Calculus - 3 credits (3 contact hours per week)

This course introduces the concepts of differentiation and integration and their applications to solving problems; the course is designed for students needing one semester of calculus. Topics include: functions, graphing, differentiation, and integration with emphasis on applications drawn from business, economics, biological and behavioral sciences. Upon completion, students should be able to demonstrate an understanding of the use of basic calculus and technology to solve problems and to analyze and communicate results.

II. PREREQUISITE: MAT 161, or MAT 171, or MAT 175

III. COREQUISITE: MAT 263A, Brief Calculus Lab

IV. EXPECTED STUDENT LEARNING OUTCOMES:

Upon completion of the course, students should be able to:

- A. Write the equation of the tangent line to a curve at a specific point.
- B. Calculate multiple derivatives of an algebraic function.
- C. Identify over which intervals a function is continuous.
- D. Classify points of discontinuity of a function.
- E. Use first and second derivative tests to identify extrema and inflection points.
- F. Use first derivative in application problems to calculate marginal cost, marginal revenue and marginal profit.
- G. Evaluate average rates of change as well as instantaneous rates of change.
- H. Calculate antiderivatives and definite integrals of algebraic functions.
- I. Calculate the area between two curves.
- J. Apply the definite integral to application problems.
- K. Apply the skills A – J above to assorted real world scenarios and problems while demonstrating the ability to interpret, analyze, and solve problems.

Caveat: The purpose of problem solving is not merely to obtain an answer but also to extend and cultivate the ability to think independently and creatively, beyond the mere application of computing rules. During the course, the student is encouraged and expected to develop a conceptual grasp of the topics and to develop the ability to move effortlessly between mathematical results and their interpretations.

V. METHODS OF INSTRUCTION:

- A. Lectures in basic concepts and skills
- B. Read text, view video lectures
- C. Class and group discussion of topics
- D. Skill-building lab exercises
- E. Team projects which employ critical thinking to enhance concept development and to apply course skills to real world problems and scenarios.

VI. CONTENT:

- A. Review of Functions: Graphing, solving and evaluating linear, nonlinear, absolute value, rational and piecewise defined functions; regression analysis and modeling
- B. Limits and Derivatives: Limits of functions, continuity of functions, rates of change as a slope, derivatives of algebraic functions, product rule, quotient rule, chain rule, higher order derivatives, exponential and logarithmic functions, and derivatives of exponential and logarithmic functions.
- C. Applications of the Derivative: First derivative test and graphing, second derivative test and graphing, absolute extrema, optimization, business applications; implicit differentiation and related rates.
- D. The Integral and Its Applications: Antiderivatives, integrals and the power rule, antiderivatives of exponentials and $1/x$, substitution technique for integration, definite integrals, area under the curve, area between two curves.

VII. TYPICAL ASSIGNMENTS:

- A. In class participation
- B. Online or textbook homework
- C. Topic quizzes
- D. Unit or chapter exams
- E. Topic labs including analysis and evaluation of course concepts
- F. Technology labs such as Excel, Derive or Maple including analysis and evaluation of course concepts
- G. Comprehensive final exam

VIII. EVALUATION:

- A. Methods of Evaluation
 - 1. Objective examinations and quizzes (for lecture and text reading assignments)
 - a. Typical questions:
 - 1. Find the equation of the tangent line to the curve $f(x) = -x^2 - x - 1$ at the point $(0, -1)$.
 - 2. Find the $\lim_{x \rightarrow 6} \frac{x + 1}{x^2 - 6}$.
 - 2. Analysis and evaluation of skill-building assignments
 - a. Review homework assignments weekly providing students with constructive feedback and recommendations for success
 - 3. Comprehensive Exam
 - a. Evaluation is based on processes and accuracy of solutions
- B. Frequency of Evaluation
 - 1. Periodic tests and/or quizzes (minimum 3 tests per semester, quizzes optional) with no more than 40% of work being completed online.
 - 2. Review student progress and provide feedback weekly for online homework and assignments.
 - 3. End-of-semester comprehensive exam.

IX. TYPICAL TEXT: Concepts of Calculus with Applications. 1st Edition by Martha Goshaw, published by Pearson Addison Wesley.

X. OTHER SUPPLIES REQUIRED OF STUDENTS:

1. A graphing calculator is required.
2. A My Math Lab student access code is required.
3. It would be highly recommended that students in Distance Education sections of the course have internet access.

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