

MAT 263 BRIEF CALCULUS

COURSE DESCRIPTION:

Prerequisites: MAT 171 or satisfactory score on placement test

Corequisites: MAT 263A

This course introduces concepts of differentiation and integration as well as 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, and 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. *This course has been approved to satisfy the Comprehensive Articulation Agreement for the general education core requirement in natural sciences/mathematics.* Course Hours Per Week: Class, 3. Semester Hours Credit, 3.

LEARNING OUTCOMES:

1. Students will be able to evaluate limits and continuity, and compute derivatives and integrals of selected functions. Students will display proficiency by demonstrating the following competencies:
 - a. Identify the slope of a straight line, write the equation of a line, find the slope-intercept and point-slope forms of a line, and sketch the graph of a line.
 - b. Write the equation of the line tangent to a given graph at a specified point.
 - c. State and use the formal definition of the derivative, and give a geometric interpretation of the meaning of the derivative.
 - d. Evaluate limits of expressions including the indeterminate forms $\frac{\infty}{\infty}$ and $\frac{0}{0}$.
 - e. State the definition of continuity at a point and use the definition to determine the continuity of a function at a point.
 - f. Use the definition of differentiability to determine if a function is differentiable at a point.
 - g. Use the power rule, product rule, quotient rule, and chain rule to differentiate functions.
 - h. Compute higher derivatives.
 - i. Differentiate implicitly.
 - j. Differentiate selected exponential functions.
 - k. Differentiate selected logarithmic functions.
 - l. Use logarithmic differentiation to differentiate selected problems.
 - m. Compute antiderivatives involving the power rule, exponential and logarithmic functions.
 - n. Evaluate definite integrals by using integration.
 - o. Integrate using substitution.
 - p. Integrate using integration by parts.
 - q. Evaluate the definite integral using substitution and change of limits.

2. Students will be able to utilize calculus techniques in order to analyze the properties and sketch graphs of functions. Students will display proficiency by demonstrating the following competencies:
 - a. Use the first derivative to identify where a function is increasing and decreasing, and to locate the maximum and minimum values.
 - b. Use the second derivative to identify a function's concavities, relative maxima and minima, and its points of inflection.
 - c. Use limits to identify asymptotes of functions.
 - d. Sketch the graphs of functions by using calculus techniques to analyze their properties.
3. Students will be able to utilize the techniques of differentiation and integration together with appropriate technology to solve practical problems and analyze and communicate results. Students will display proficiency by demonstrating the following competencies:
 - a. Solve practical problems involving optimization and related rates.
 - b. Solve practical problems using exponential and logarithmic functions.
 - c. Estimate area using Riemann sums.
 - d. Use integration to find the area of a region bounded by curves.
 - e. Solve practical problems using the definite integral.
 - f. Compare the results of average rate of change to instantaneous rate of change.

OUTLINE OF INSTRUCTION

- I. The Derivative
 - A. The slope of a straight line
 - B. The slope of a curve at a point
 - C. The derivative
 - D. Limits and the derivative
 - E. Differentiability and continuity
 - F. Some rules for differentiation
 - G. More about derivatives
 - H. The derivative as a rate of change
- II. Applications of the Derivative
 - A. Describing graphs of functions
 - B. The first and second derivative rules
 - C. Curve sketching
 - D. Optimization problems
 - E. Applications of derivatives to business and economics
- III. Techniques of Differentiation
 - A. The product and quotient rules
 - B. The chain rule and the general power rule
 - C. Implicit differentiation and related rates

- IV. Logarithm Functions
 - A. Exponential functions
 - B. The exponential function e^x
 - C. Differentiation of exponential functions
 - D. The natural logarithm function
 - E. The derivative of $\ln x$
 - F. Properties of the natural logarithm function

- V. Applications of the Exponential and Natural Logarithm Functions
 - A. Exponential growth and decay
 - B. Compound interest
 - C. Applications of the natural logarithm function to economics

- VI. The Definite Integral
 - A. Antidifferentiation
 - B. Areas and Riemann sums
 - C. Definite integrals and the Fundamental Theorem
 - D. Areas in the xy -plane

- VII. Techniques of Integration
 - A. Integration by substitution
 - B. Integration by parts
 - C. Evaluation of definite integrals

REQUIRED TEXTBOOK AND MATERIALS:

Goldstein, Larry J., David C. Lay, David I. Schneider, and Nakhle H. Asmar. Calculus and Its Applications. 11th Ed. Pearson Prentice Hall, 2010.

TI-83/84 Graphing Calculator

STATEMENT OF DISABILITIES ACCOMMODATION:

Students who require academic accommodations due to any physical, psychological, or learning disability are encouraged to request assistance from a disability services counselor within the first two weeks of class. Likewise, students who potentially require emergency medical attention due to any chronic health condition are encouraged to disclose this information to a disability services counselor within the first two weeks of class. Counselors can be contacted by calling 686-3652 or by visiting the Student Development Office in the Phail Wynn Jr. Student Services Center, room 1309.