

University of Arkansas – Fort Smith 5210 Grand Avenue
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General Syllabus

MATH 24004 Calculus I

Credit Hours: 4 Lecture Hours: 3 Laboratory Hours: 2

Prerequisite(s): MATH 12003 Plane Trigonometry or MATH 13005 Precalculus Mathematics
or required placement score

Effective Catalog: 2026-2027

I. Course Information

A. Catalog Description

Topics include concepts, techniques, and applications of limits, continuity, derivatives, and integrals of algebraic, exponential, logarithmic, trigonometric, and inverse trigonometric functions. Appropriate technology is used to discover relationships and to work problems not usually possible to work by hand. (ACTS: MATH 24005)

B. Additional Information – None

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Calculate limits including at a point, one-sided limits, and limits at infinity graphically, numerically, and algebraically.
2. Apply laws of limits to evaluate limits algebraically.
3. Apply l'Hôpital's Rule to compute appropriate limits.
4. Define algebraic and geometric definitions of continuity and differentiability.
5. Define, interpret, and approximate the derivative at a point.
6. Define the derivative function and higher order derivatives.
7. Find the derivative of a function from the definition.
8. Compute the derivatives of power, exponential, logarithm, trigonometric, and inverse trigonometric functions and combinations of these using the constant multiple, sum, product, quotient, and chain rules.
9. Use derivatives and limits to analyze graphs of functions, including describing asymptotes, removable discontinuities, extrema, concavity, and inflection points.
10. Apply the Mean Value Theorem.
11. Apply derivatives to solve optimization problems in a variety of contexts including natural sciences, economics, and the social sciences.
12. Apply derivatives to solve related rate problems in a variety of contexts.
13. Define, interpret, and approximate a definite integral.
14. Approximate definite integrals with right, left, and midpoint Riemann sums, the trapezoidal rule, and Simpson's rule.

15. State the First and Second Fundamental Theorem of Calculus and use them to evaluate expressions.
16. Find antiderivatives and use them to compute definite integrals using basic integration rules and integration by substitution.
17. Apply integrals to find the area between curves, the average value of a function, and solutions to economic applications.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills:

Quantitative Reasoning

Students will extend quantitative reasoning abilities to include analysis of rates of change and cumulative effects of variable quantities. Success requires students to integrate numerical, graphical, and analytical representations of the same relationship.

III. Major Course Topics

- A. Limits and Their Properties
- B. Differentiation: definitions, concepts, approximating, calculating formulas
- C. Integration: definitions, concepts, approximating, calculating formulas
- D. Applications of calculus using derivatives and integrals
- E. Fundamental Theorem of Calculus