Southeastern University
College of Natural and Health Sciences
Department of Mathematics
MATH 2144 - Calculus I
Official Syllabus

Catalog Description

This course involves the study of limits and continuity, derivatives, and applications.

Prerequisite: MATH 1413 or a Precalculus/Calculus course in high school Credit Hours: 4

Repeatable: Course not repeatable

Intended Learning Outcomes

Students who successfully complete this course will:

1. Verify the value of the limit of a function at a point using the definition of the limit.
2. Calculate the limit of a function at a point numerically and algebraically using appropriate techniques, including L'Hospital's rule.
3. Find points of discontinuity for functions and classify them.
4. Demonstrate an understanding of the consequences of the Intermediate Value Theorem for continuous functions.
5. Describe the relationship between the slope of the secant line and the slope of the tangent line.
6. Discuss the derivative of a function at a point as the instantaneous rate of change.
7. Interpret the derivative of a function at a point as the slope of the tangent line and estimate its value from the graph of a function.
8. Recognize the graph of the derivative from the given graph of a function.
9. Approximate the value of the derivative at a point using the difference quotient.
10. Compute the value of the derivative at a point algebraically using the (limit) definition.
11. Derive the expression for the derivative of elementary functions from the (limit) definition.
12. Show whether a function is differentiable at a point.
13. Compute the equation for the line tangent to a function at a point.
14. Interpret the tangent line geometrically as the local linearization of a function.
15. Compute the expression for the derivative of a function using the rules of differentiation, including the power rule, product rule, quotient rule, and chain rule.
16. Differentiate a relation implicitly and compute the line tangent to its graph at a point.
17. Differentiate exponential, logarithmic, trigonometric, and inverse trigonometric functions.
18. Obtain expressions for higher-order derivatives of a function using the rules of differentiation.
19. Demonstrate understanding of the consequences of Rolle's theorem and the Mean Value Theorem for differentiable functions.

20. Interpret the value of the first and second derivative as measures of increase and concavity of a function.
21. Compute the critical points of a function on an interval.
22. Identify the extrema of a function on an interval and classify them as minima, maxima, or saddles using the first derivative test.
23. Implement Newton's Method to find a root of a polynomial.
24. Find the antiderivative of elementary polynomials, exponential, logarithmic, and trigonometric functions.
25. Estimate the area under a curve using finite sums.
26. Evaluate Riemann sums.
27. Compute definite integrals.
28. Apply the Fundamental Theorem of Calculus.