

CALCULUS

PURPOSE:

Students will apply limits, derivatives and integrals to a variety of functions and their applications.
5 hours of college credit available.

BENCHMARKS AND INDICATORS:

1 Finds limits and determines continuity of functions

- C11 Finds the limits of functions as x approaches a number
- C12 Finds the limits of functions that involve infinity
- C13 Apply the sandwich theorem to prove the limit of $(\sin x)/x$ and use this limit to find limits of other functions
- C14 Determine if a function is continuous or not over a given interval
- C15 Determines the type of discontinuity of a function – jump, fixable and infinite
- C16 Proves the limits of functions using epsilons and deltas

2 Finds derivatives of algebraic functions and relations

- C21 Demonstrates that the slope of a tangent line is the limit of the slope of a function at a point
- C22 Uses the power rule for finding a derivative
- C23 Uses the product and division rule for finding a derivative
- C24 Finds the derivatives of trig functions
- C25 Uses the chain rule to find derivatives of composite functions
- C26 Uses implicit differentiation to find derivatives of relations

3. Solve Application problems using derivatives

- C31 Estimates y values by using linearization and differentials
- C32 Solves related rates of change problems
- C33 Finds extreme values of functions
- C34 Uses y' to describe when the graph is increasing or decreasing and locate minimums and maximums
- C35 Uses y'' to tell where the graph is concave up or concave down and locate points of concavity
- C36 Finds asymptotes of rational functions both horizontal, oblique and vertical
- C37 Verifies the Mean Value theorem for derivatives
- C38 Finds the maximum and minimum values of real-world problems
- C39 Finds the velocity and acceleration equations given the distance equation
- C40 Finds the function given the derivative of polynomial functions and trig functions

4. Finds the area under a curve and integrates algebraic and trig functions

- C41 Estimates the area under a curve to the x axis by using rectangles
- C42 Uses summation notation
- C43 Defines a Reimann sum and translates it into a definite integral
- C44 Uses properties of definite integrals to transform them and relate the properties to area under the curve
- C45 Verifies the mean value theorem for integration

- C46 Demonstrate the Fundamental Theorem of Calculus
- C47 Solves indefinite integrals
- C48 Use the substitution rule to solve definite and indefinite integrals
- C49 Use Trapezoidal rule and Simpson's rule to estimate the area under the curve

5. Finds the derivative and integrals of transcendental functions

- C51 Estimates the value of e by finding a base for an exponential function that has the same slope as its y value
- C52 Finds the derivative of a function by using the derivative of its inverse function
- C53 Finds the derivative of logarithmic functions
- C54 Integrates log functions and exponential functions
- C55 Solve growth and decay problems
- C56 Use L'Hopital's rule to find limits using derivatives
- C57 Find derivatives of inverse trig functions