

MONROE COUNTY COMMUNITY SCHOOL CORPORATION  
CURRICULUM GUIDE

**CALCULUS**

**PROFICIENCY 1: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF  
FUNCTIONS AND GRAPHS**

- 1.1 Define functions from problematic situations
- 1.2 Determine whether a given function is even or odd
- 1.3 Determine the zeros of a function
- 1.4 Graph trigonometric functions and determine their periods, amplitudes, and phase shifts
- 1.5 Find the slope of a linear function
- 1.6 Use the standard forms to write an equation of a line that fits given conditions
- 1.7 Graph exponential and logarithmic functions and use their inverse relationships
- 1.8 Find the asymptotes of the graph of a function
- 1.9 Describe the symmetry of the graph of a function

**PROFICIENCY 2: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF LIMITS  
AND CONTINUITY**

- 2.1 Find or approximate limits intuitively using a calculator
- 2.2 Find limits of functions by substitution
- 2.3 Find limits using the constant, sum, difference, product, and quotient rules
- 2.4 Find the limit of a rational function that has an indeterminate form
- 2.5 Find one-sided limits
- 2.6 Find limits at infinity
- 2.7 Determine when a limit is infinite
- 2.8 Use the definition of continuity to determine whether a function is continuous at a point
- 2.9 Use the intermediate value theorem on a function over a closed interval

- 2.10 Determine the types of discontinuities of a function
- 2.11 Apply the theorem, "If  $f(x)$  is continuous over a closed interval, then  $f$  has a maximum and a minimum value on the interval"

**PROFICIENCY 3: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS OF DIFFERENTIAL CALCULUS**

- 3.1 State and apply the definition of derivative
- 3.2 Find the derivatives of elementary functions including algebraic, trigonometric, exponential, and logarithmic
- 3.3 Find the derivatives of sums, products, and quotients
- 3.4 Determine the derivative of a composite function (chain rule)
- 3.5 Find the derivatives of implicitly defined functions
- 3.6 Find derivatives of higher order
- 3.7 Find the derivative of the inverse of a function
- 3.8 Find derivatives using logarithmic differentiation
- 3.9 Use the relation between differentiability and continuity
- 3.10 Apply the Mean Value Theorem
- 3.11 Use L'Hôpital's Rule

**PROFICIENCY 4: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF THE APPLICATIONS OF THE CONCEPTS OF A DERIVATIVE**

- 4.1 Find the slope of a curve
- 4.2 Find the tangent and normal lines
- 4.3 Determine where a function is increasing and where it is decreasing
- 4.4 Find critical points, relative (local), and absolute maximum and minimum points
- 4.5 Determine the concavity and points of inflection of a function
- 4.6 Use first and second derivatives to help sketch a curve
- 4.7 Use differentials to approximate change
- 4.8 Use Newton's Method to approximate the zeros of a function or the intersection of two functions
- 4.9 Solve optimization problems

- 4.10 Find average and instantaneous rates of change
- 4.11 Find the velocity and acceleration of a particle moving in a straight line
- 4.12 Find related rates of change

**PROFICIENCY 5: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS OF INTEGRAL CALCULUS**

- 5.1 Use rectangle approximation techniques to find approximate value of integrals
- 5.2 Calculate the values of Riemann Sums
- 5.3 Recognize and write definite integrals as limits of Riemann Sums and vice versa
- 5.4 Use the Fundamental Theorem of Calculus
- 5.5 Use properties of antiderivatives and the Fundamental Theorem of Calculus to evaluate definite and indefinite integrals
- 5.6 Use properties of definite integrals
- 5.7 Use the technique of integration by substitution (change of variables) to find values of integrals
- 5.8 Use the technique of integration by parts
- 5.9 Use the technique of integration by trigonometric substitution
- 5.10 Use numeric techniques such as the Trapezoidal Rule, Simpson's Rule, or technology to approximate definite integrals

**PROFICIENCY 6: THE LEARNER WILL DEVELOP AN UNDERSTANDING OF THE APPLICATIONS OF INTEGRAL CALCULUS**

- 6.1 Derive velocity functions from acceleration functions and/or position functions from velocity functions given the necessary initial conditions
- 6.2 Solve separable differential equations of the form  $f(x) dx = g(y) dy$
- 6.3 Solve differential equations of the form  $y' = ky$  as applied growth and decay problems
- 6.4 Use definite integrals to find the area under a curve and above the x-axis
- 6.5 Use definite integrals to find the area between two curves
- 6.6 Use definite integrals to find the average value of a function over a closed interval
- 6.7 Use definite integrals to find the volume of a solid with known cross-sectional areas
- 6.8 Use definite integrals to find the volume of a solid obtained by revolving an area about the x-axis, y-axis, or a line parallel to either axis (Disc, washer, and shell methods)

- 6.9 Use definite integrals to calculate the surface area of a solid obtained by revolving a region about one of the coordinate axes
- 6.10 Write improper integrals as limits of definite integrals to determine their nature (convergent or divergent) and find the values of those that converge