

HONORS PRE-CALCULUS

1. Enduring Understandings (*broad ideas, usually grounded in the discipline*):

- **Mathematics as Calculation** – performing calculations. Knowing when exact versus generalized calculation is appropriate and develops insight into a mathematical theory when they see how it relates to actual calculations.
- **Mathematics as a Field of study** – using mathematical vocabulary. Communicate clearly by using the formal vocabulary and rules of mathematics.
- **Mathematics as a Modeling Language** – using mathematical models. Understand the various types of models used in mathematics and how to translate real life situations to those mathematical models to obtain a solution and then to translate those solutions back into the context of the real-life application.
- **Mathematics as Logical Thought** – thinking logically. Think logically in a world that requires careful thought as a reasoning process

2. Course Specific Goals (*aligned with Content Standards*):

- **Understanding families of functions** - linear, exponential, logarithmic, radical, rational and quadratic equations
- **Representing functions in multiple ways** - verbal descriptions, equations, tables, and graphs
- **Understanding Trigonometric Functions** – Properties, identities, formulas, and applications
- **Understand all components necessary to be successful in Calculus** – Previously mentioned as well as polar coordinates, vectors, conics, sequences, and series.
- Use of technology and graphing calculators to understand and apply mathematical concepts

3. Expected Performances (*aligned with state Expected Performances*)

- Graphs and Equations
- Functions and their Graphs
- Polynomial and Rational Functions
- Exponential and Logarithmic Functions
- Trigonometric Functions

- Analytic Trigonometry
- Applications of Trigonometric Functions
- Systems of Equations and Inequalities
- Polar Coordinates; Vectors
- Analytic Geometry
- A Preview of Calculus: The Limit and the Derivative of a Function
- Sequences

Pre-Calculus Scope and Sequence

1. Graphs and Equations: Students will review Algebra II skills. They include Graphing points, lines, circles; best fit lines, solving equations and inequalities, and application of word problems to solving equations.
2. Functions and their Graphs: Students will review relations, identify the graph of a function, find the value of a function as well as the domain; they will study specific graphs of functions and identify increasing and decreasing intervals, maximum and minimum points, and identify if a function is odd or even; they will learn how to perform operations on functions and apply functions to real life situations
3. Polynomial and Rational Functions: Students will learn how to apply their graphing calculator to curve fitting of polynomial and power functions; study rational functions and their asymptotes; find zeros, real and imaginary, of functions; and solve polynomial and rational inequalities.
4. Exponential and Logarithmic Functions: Students will learn how to find the inverse of a function; study exponential and logarithmic functions as well as properties of logarithmic functions; they will learn how to solve exponential and logarithmic equations; they will study compound interest, growth and decay, and how to use their graphing calculator to do exponential, logarithmic, and logistic curve fitting.
5. Trigonometric Functions: Students will learn how to convert angle measurements from degrees min. sec. to decimal form, radian measure to degree measure and back again; they will learn how to find the exact measure of trig. functions using the unit circle given a point, a 45-45-90 triangle, or a 30-60-90 triangle; they will learn the properties of trig. functions as well as study graphs and inverse of graphs of trig. functions and their domains.
6. Analytic Trigonometry: Students will establish trig. identities; learn about and apply sum and difference formulas, double and half angle formulas, product-to-sum and sum-to-product formulas; they will also use the identities and formulas to solve trig. equations.
7. Applications of Trigonometric Functions: Students will learn how to solve right triangles, the Law of Sines, Cosines, and find the Area of a Triangle using the Sine function; they will also apply all of this knowledge to real life situations; they will use their graphing calculator to do Sinusoidal curve fitting; and learn about simple harmonic and damped motion.

8. Systems of Equations and Inequalities: Students will review how to solve systems of equations and expand on that knowledge by solve a system of three or more equations by hand as well as with the use of a graphing calculator; they will perform partial fraction decomposition; solve systems of nonlinear equations as well as inequalities; and perform linear programming.
9. Polar Coordinates; Vectors: Students will learn about polar coordinates and their graphs; vectors and their properties.
10. Analytic Geometry: Students will learn about conic sections (parabola, ellipse, hyperbola, and circle) and their relations with each other; polar equations of conics; they will also learn about parametric equations, how to graph them by hand as well as with the graphing calculator.
11. A Preview of Calculus: The Limit and the Derivative of a Function: Students will learn how to find limits by tables, graphing, and algebraic techniques; they will study the tangent problem and the derivative.
12. Sequences: Students will learn about arithmetic and geometric sequences, and geometric series.