

Trigonometry/Introduction to Calculus

5 credits – Level I

Grade: 12

Prerequisite: Minimum grade of 70 in Algebra II Level I (or a minimum of 90 in Algebra II Topics and Trigonometry)

The major part of this course consists of trigonometry. Units of study include circular functions and their graphs, inverse circular functions, identities, trigonometric functions, and solutions of triangles. The latter part of the course consists of an introduction to calculus. Units of study include differentiation, velocity and acceleration, tangents to a curve, and related rates. This course is designed for students who will be taking calculus in college.

PROFICIENCIES

FOUNDATIONS

- represent and order real numbers, use inequalities, find absolute value and distance, and evaluate algebraic expressions using the basic rules of algebra
- identify different types of equations, solve linear equations in one variable, solve quadratic equations, solve polynomial equations of degree three or greater, and solve equations involving radicals or absolute values
- plot points in the Cartesian plane, use the Distance and Midpoint Formulas, sketch graphs of equations, and find x- and y-intercepts of graphs of equations
- find the slopes of lines and use slope to write and graph linear equations in two variables
- use function notation and how to evaluate functions and find their domains
- use the Vertical Line Test, find zeros of functions, identify intervals on which functions are increasing or decreasing, and identify even and odd functions
- identify and graph linear, squaring, cubic, square root, reciprocal, step, and piecewise-defined functions, and how to recognize the graphs of common functions
- identify and graph shifts, reflections, and non-rigid transformations of functions
- find arithmetic combinations and compositions of functions
- find inverses of functions graphically and algebraically

TRIGONOMETRY

- describe an angle and to convert between degree and radian measures
- evaluate trigonometric functions
- use the fundamental trigonometric identities
- evaluate trigonometric functions of any angle and of real numbers
- sketch and translate the graphs of sine and cosine functions
- sketch the graphs of trigonometric functions
- evaluate the inverse trigonometric functions and compositions of trigonometric functions
- solve applications involving trigonometric functions

ANALYTIC TRIGONOMETRY

- use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions
- verify trigonometric identities
- use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations
- use sum and difference formulas to evaluate trigonometric functions, verify identities, and solve trigonometric equations
- use multiple-angle formulas, power-reducing formulas, half-angle formulas, and product-to-sum formulas to rewrite and evaluate trigonometric functions

ADDITIONAL TOPICS IN TRIGONOMETRY

- use the Law of Sines to solve and find the areas of oblique triangles
- use the Law of Cosines to solve oblique triangles and how to use Heron's Formula to find the area of a triangle
- write the component forms of vectors and perform basic vector operations, how to write vectors as linear combinations of unit vectors, and how to find the direction angles of vectors
- find the dot product of two vectors and the angle between two vectors, how to determine whether two vectors are orthogonal, and how to write a vector as the sum of two vector components

INTRODUCTION TO CALCULUS

- define and calculate limits of function values
- understand and apply concept of derivatives