Syllabus for Pre-Calculus

This class further develops those skills learned in Functions and Stats & Trig to finish rounding out all Pre-Calculus concepts. This class will work on further analysis of equations and spend time developing and understanding the logistics of mathematics and why numbers and mathematical concepts work the way that they do. Study of both Derivatives and Integrals (basic mathematical concepts used in Calculus) will be examined. At the completion of this class, students should have an understanding of all concepts taught in College Algebra and should have a skill set level to take college Calculus.

Topic: The Derivative in Calculus

Concepts: Difference Quotients and Rates of Change

The Derivative at a Point

The Derivative Function

Acceleration and Deceleration

Using Derivatives to Analyze Graphs

Derivatives of Exponential Functions

Topic: Polar Coordinates and Polar Graphs

Concepts: Inverse Trigonometric Functions

Polar Coordinates

Graphing Equations in Polar Coordinates

Rose Curves and Spirals

Rectangular and Polar Equations for the Same Curve

Definitions for the Conic Sections

Polar Equations for the Conic Sections

Topic: Complex Numbers

Concepts: The Geometry of Complex Numbers

Powers of Complex Numbers

Roots of Complex Numbers

Complex Numbers and Transformations of the Plane

The number of Zeros of a Polynomial

Nonreal Zeros of Polynomials with Real Coefficients

Some Discrete Dynamical Systems

Topic: Vectors and Parametric Equations

Concepts: Parametric Equations

Obtaining Information from Parametric Equations

Modeling with Parametrically Defined Curves

Vectors in a Plane

Adding and Subtracting Vectors

Parallel Vectors and Equations of Lines

The Dot Product and the Angle between Two Vectors

Topic: Three-Dimensional Space

Concepts: Extending 2-Space to 3-Space

Vectors in 3-Space

Cross Product and Vector Properties

Lines and Planes in 3-Space

The Geometry of Systems of Linear Equations in Three Variables

Cylindrical and Spherical Coordinates for 3-Space

Topic: Combinatorics

Concepts: What exactly are you counting?

Possibility Trees and the Multiplication Counting Principle

Permutations

Combinations

The Binomial Theorem

Counting and the Binomial Theorem

Combinations with Repetition

Multinomial Coefficients

Topic: Graphs and Circuits

Concepts: Modeling with Graphs

The Definition of Graph

Handshake Problems

The Konigsberg Bridge Problem

Walk Lengths and Minimum Paths

Markov Chains

Euler’s Formula

Topic The Integral in Calculus

Concepts: From the Discrete to the Continuous

Riemann Sums

The Definite Integral

Properties of Definite Integrals

The Area Under a Parabola

Volumes of Surfaces of Revolution

The Fundamental Theorem of Calculus