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