**Course Descriptions – Pre Calculus**

This class is a survey class covering several areas in mathematics in preparation for success in future calculus classes. The class is a combination of lecture, application problems, and hands-on demonstration. Text: Advanced Mathematics: Pre-calculus with Discrete Mathematics and Data Analysis.

**Pre-calculus**

Unit 1 **Linear and Quadratic Functions:** Points and Lines, Slopes of Lines, Finding Equations of Lines, Linear Functions. The complex Numbers, Solving Quadratic Equations, Graphing Quadratic Functions, Quadratic Models.

Unit 2 **Polynomial Functions:** Polynomials, Synthetic Division; The Remainder and Factor Theorems, Graphing, Equations Solving.

Unit 3 **Inequalities:** Linear Inequalities, Absolute Value, Polynomial Inequalities in One Variable, Polynomial Inequalities in Two Variable, Linear Programming.

Unit 4 **Functions:** Functions, Operations on Functions, Reflecting Graphs; Symmetry, Periodic Functions, Stretching and Translating Graphs, Inverse Functions, Functions of Two Variables, Forming Functions from Verbal Descriptions

Unit 5 **Exponents and Logarithms:** Growth and Decay Integral Exponents and Rational Exponents, Exponential Functions, The number e and the Function ex, Logarithmic Functions, laws of Logarithms, Exponential Equations, Changing Bases.

Unit 6 **Analytic Geometry:** Coordinate Proofs, Equations of Circles, Ellipses, Hyperbolas, Parabolas, Conic Sections.

Unit 7 **Trigonometric Functions:** Measurement of Angles, Sectors of Circles, Sine and Cosine Functions, Evaluating and Graphing Sine and Cosine, Other Trigonometric Functions, Inverse Trigonometric Functions.

Unit 8 **Trigonometric Equations and Applications:** Simple Trigonometric Equations, Sine and Cosine Curves, Modeling Periodic Behavior, Relationships Among the Functions, Solving More Difficult Trigonometric Equations.

Unit 9 **Triangle Trigonometry:** Solving Right Triangles, The Area of a Triangle, The law of Sines, The Law of Cosines, Appkications of Trigonometry to navigation and Surveying.

Unit 10 **Trigonometric Addition Formulas:** Formulas for cos, sin, and tan. Double Angle and Half Angle Formulas, Solving Trigonometric Equations.

Unit 11 **Polar Coordinates and Complex Numbers:** Polar Coordinates and Graphs, Geometric Representations of Complex Numbers, Powers of Complex Numbers, Roots of Complex Numbers.

Unit 12 **Vectors and Determinants:** Geometric Representation of Vectors, Algebraic Representation of Vectors, Vector and Parametric Equations Motions in a Plane, Parallel and Perpendicular Vectors Dot Product, Vectors in Three Dimensions, Vectors and Planes, Determinants, Applications of Determinants, Determinants and Vectors in Three Dimensions.

Unit 13 **Sequences and Series:** Arithmetic and Geometric Sequences, Recursive Definitions, Arithmetic and Geometric Series and Their Sums, Limits of Infinite Sequences, Sums of infinite Series, Sigma Notation, mathematical Induction.

Unit 14 **Matrices:** Matrix Addition and Scalar Multiplication, Matrix Multiplication, Applying Matrices to Linear Systems, Communication Matrices, Transition Matrices, Transformation Matrices.

Unit 15 **Combinatorics:** Venn Diagrams, The Multiplication addition and Complement Principles, Permutations and Combinations, Permutations with Repetition, Circular Permutations, Binomial Theorem, Pascal’s Triangle.

Unit 16. **Probability:** Introduction to Probability, Probability of Events Occurring Together, Binomial Probability Theorem, Probability Problems Solved with Combinations.

Unit 17. **Statistics:** Tables, Graphs, And Averages, Box and Whisker Plots, Variability, The Normal Distribution, Sampling, Confidence intervals.

Unit 18. **Curve Fitting and Models:** Introduction to Curve Fitting Least Squares Line, Fitting Exponential Curves, Fitting Power Curves, Choosing the Best Model.

Unit 19 **Limits Series and Iterated Functions:** Limits of Functions, Graphs of Rational Functions, Using Technology to Approximate the Area under a Curve, Power Series, Analyzing Orbits, Applications of Iterated Functions.

Unit 20 **Introduction to Calculus:** The Slope of a Curve, using Derivatives in Curve Sketching, Extreme Value Problems, Velocity and Acceleration.

We will try and get through as much of this material as possible this year. Since this is a high school class we will concentrate on shoring up any deficiencies in basic algebraic or trigonometric understanding before moving to the next topic(s).