Precalculus, Part 2
Course Outline & Objectives

Course Description:
Students will build on previous fundamental concepts from Algebra I, Geometry, and Algebra II or Integrated Math 1, 2, & 3 courses. Students will use the concepts in this course, especially functions to strengthen previous mathematical reasoning and conceptual understanding for mathematical problem solving. Proficiency with these topics is especially important for students who are interested in preparing for college math courses and/or who intend to study Calculus.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits)
Prerequisites: Algebra 1; Geometry; and Algebra 2 OR Integrated Math 1; Integrated Math 2; Integrated Math 3 AND Precalculus, Part 1

Course Outline

Unit 1 – Polar Coordinates and Complex Numbers

1.1 Introduction to the Polar Coordinate System
1.2 Polar & Rectangular Forms of Equations
1.3 Graphs of Polar Equations
1.4 Complex Numbers
1.5 Complex Numbers in Polar Form
1.6 DeMoivre's Theorem

Common Core Standards

In this unit:
Students will be introduced to the polar coordinate system, specifically points, equations, and graphs. They will learn how to graph points using polar coordinates. They will graph polar equations. They will learn how to convert between rectangular and polar coordinates and equations. They will learn how complex numbers can be represented in polar form. They will perform operations and define certain characteristics of complex numbers when written in polar form.

[N-CN, F-IF, G-GPE]

Unit 2 – Matrices

2.1 Characteristics of Matrices and Matrix Operations
2.2 Matrix Multiplication
2.3 Determinants and Inverses of Matrices
2.4 Solving Systems of Linear Equations using Inverse Matrices and Cramer's Rule
2.5 Gaussian Elimination and Gauss-Jordan Elimination

In this unit:
Students will learn about matrices. Most of the focus will be on 2x2 and 3x3 matrices, but much of what the student will learn can also be applied to matrices of other sizes. Students will learn how to perform operations with matrices, find inverses and determinants of matrices, and learn a few different methods for solving systems of linear equations using matrices.

[N-VM, A-REI]

Unit 3 – Vectors

3.1 Introduction to Vectors
3.2 Operations with Vectors
3.3 Dot Products and Vector Projections
3.4 Vectors in Three Dimensions
3.5 Applications with Vectors

In this unit:
Students will learn what vectors are and what defines them. They will learn how to express vectors both algebraically and graphically and perform operations with them. They will explore two-dimensional as well as three-dimensional vectors. They will apply the knowledge they have gained to solve some real-world problems.

[N-VM]

Course Outline

Unit 4 – Conic Sections and Parametric Equations

4.1 Circles & Ellipses
4.2 Parabolas
4.3 Hyperbolas
4.4 Classifying Conic Sections, Eccentricity, and Rotations
4.5 Parametric Equations

Common Core Standards

In this unit:
Students will learn about the four conic sections - circles, ellipses, parabolas, and hyperbolas. They will learn how to write equations for these different conic sections as well as how to identify important characteristics about each of them and then use those characteristics to graph them accurately. They will learn how to classify conic sections when they are given in general form. They will learn how to write equations and graph conic sections that have been rotated from the usual x-y plane. They will learn about parametric equations and their significance in solving real-world problems involving projectile motion.

[G-GPE, A-REI, F-IF]

Unit 5 – Sequences, Probability, and Introduction to Calculus

5.1 Arithmetic Sequences & Series
5.2 Geometric Sequences & Series
5.3 Binomial Theorem
5.4 Counting Principles & Probability
5.5 A Glimpse into Calculus

In this unit:
Students will learn about different kinds of ordered lists of numbers called sequences and their sums, called series: They will learn about arithmetic sequences and series as well as geometric sequences and series. They will learn about the Binomial Theorem. They will learn some counting principles for calculating probabilities of certain events occurring. They will get a preview of Calculus. They will get to see a brief snapshot into the three major fundamental concepts taught in a typical Calculus course.

[A-APR, F-BF, F-IF, S-CP, S-MD]