College Algebra
Diocese of Greensburg Curriculum

Unit	Standards	Content	Skills
Review	**NCTM: Mathematics** **NCTM: Grades 9 - 12** **Algebra** **Understand patterns, relations, and functions** understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions; **Represent and analyze mathematical situations and structures using algebraic symbols** understand the meaning of equivalent forms of expressions, equations, inequalities, and relations; write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency-mentally or with paper and pencil in simple cases and using technology in all cases; Used with permission of the National Council of Teachers of Mathematics. This use does not imply endorsement of materials or validation of alignment.	Set Notation Factoring - all methods Simplifying Rational Expressions Solving Rational Expressions Rational Exponents	**The students will be able:** **Knowledge** • Understand set notation **Synthesis** **Comprehension** • Rewrite fractions with a common denominator **Analysis** • Determine what method of factoring used to solve a problem **Application** • Simplify rational expressions • Simplify complex fractions **Evaluations**
Linear Functions	**SAT: Mathematics and Statistics** **SAT: High School** **Algebra I** **Standard AI.2** **Variables, Expressions, Equations, and Functions in Linear**	Interval Notation Absolute Value Equations	**The students will be able:** **Knowledge** • Understand Interval Notation

	Objective AI.2.1 **Student represents linear patterns using expressions, equations, functions, and inequalities and interprets the meanings of these representations, recognizing which are equivalent and which are not.** A I.2.1.3 Develops equivalent algebraic expressions, equations, and inequalities using the properties of equality and inequality, as well as the commutative, associative, inverse, identity, and distributive properties. **Objective AI.2.3** **Student constructs, solves, and interprets solutions of linear equations, linear inequalities, and systems of linear equations representing mathematical and real-world contexts.** A I.2.3.2 Analyzes and explains the reasoning used to solve linear equations and linear inequalities. **Algebra II** **Objective AII.1.2** **Student represents, compares, translates among representations, and graphically, symbolically, and tabularly represents, interprets, and solves problems involving quadratic functions.** A II.1.2.5 Formulates equations and inequalities based on quadratic functions, solves them using factoring, completing the square, and technology, and interprets their solutions in terms of the original problem context. **Objective AII.2.3** **Student interprets and represents rational and radical functions and solves rational and radical equations.** A II.2.3.2 Models problem situations by constructing equations and inequalities based on rational functions, uses a variety of methods to solve them, and interprets the solutions in terms of the problem situation.	Linear Inequalities Graphing Linear Functions Writing Linear Equations Combining and Composition of Functions	**Synthesis** • **Combine/composition of functions** **Comprehension** **Application** • **Solve** inequalites in two variables and express solution on a line graph, as an inequality, and in interval notations **Evaluations**

	Standard AII.3 **Systems of Equations and Inequalities and Matrices** **Objective AII.3.1** **Student constructs, solves, and interprets solutions of systems of linear equations in two variables representing mathematical and real-world contexts.** A II.3.1.3 Solves a system of linear equations in two variables using symbolic methods and graphically, and interprets the meaning of the solution.		
Graphing Non-Linear Functions	**SAT: Mathematics and Statistics** **SAT: High School** **Algebra II** **Standard AII.1** **Polynomial Expressions, Functions, and Equations** **Objective AII.1.1** **Student operates with monomials, binomials, and polynomials, applies these operations to analyze the graphical behavior of polynomial functions, and applies the composition of functions to model and solve problems.** A II.1.1.2 Analyzes and describes graphs of polynomial functions by examining their intercepts, zeros, domain and range, and local (turning points) and global (end) behavior. **Objective AII.1.2** **Student represents, compares, translates among representations, and graphically, symbolically, and tabularly represents, interprets, and solves problems involving quadratic functions.** A II.1.2.1 Identifies, interprets, and translates among different representations of quadratic functions, realizing that their graphs are parabolas.	Parent Functions Translating Functions Polynomial Functions x and y-intercepts	• **Determine** the maximum and minimum value of quadratic function • **Transform** the graph of a parabola using vertex form • **Graph** quadratic functions • **Classify** polynomials • **Model** data using calculator • **Write** polynomial expressions in standard form • **Factor** polynomials • **Determine** relative maximum and relative minimum • **Find** the zeros of polynomial functions and their multiplicity • **Write** polynomial functions from its zeros • **Divide** polynomial expressions using long division • **Divide** polynomial expressions using synthetic division • **Solve** polynomial equations • **Use** rational root theorem, irrational root theorem, and imaginary root theorem • **Write** polynomial equation from its roots

[Quadratic Functions](#)	**SAT: Mathematics and Statistics** **SAT: High School** **Algebra I** **Objective AI.3.2** **Student represents and interprets simple exponential and quadratic functions based on mathematical and real-world phenomena using tables, symbolic forms, or graphical representations and solves equations related to these functions.** A I.3.2.2 Distinguishes among general representations for exponential equations ($y = bx$, $y = a(bx)$) and quadratic equations ($y = x2$, $y = −x2$, $y = ax2$, $y = x2 + c$, $y = ax2 + c$), and describes how the values of a, b, and c affect their graphical and tabular representations. A I.3.2.3 Provides and describes multiple representations of solutions to simple exponential and quadratic equations using manipulative models, tables, graphs, symbolic expressions, and technology. A I.3.2.4 Factors simple quadratic expressions (limited to the removal of monomial terms, perfect-square trinomials, difference of squares, and quadratics of the form $x2 + bx + c$ that factor over the integers), and applies the zero-product property to determine the solutions of the related equation. A I.3.2.5 Solves quadratic equations using completing the square and technology, and interprets such solutions in terms of the original problem context.	Quadratic Formula Completing the Square Graphing Parabolas in Vertex Form	• **Identify** quadratic function • **Factor** quadratic expressions (common and the binomial factors) • **Utilize** the difference of 2 perfect squares rule • **Simplify** radicals • **Solve** quadratic equations by factoring, graphing, and by finding square roots • **Identify and write** complex numbers • **Perform** all operations with complex numbers • **Solve** quadratic equations by completing the square • **Solve** quadratic equation by using the Quadratic Formula • **Determine the** quadratic function that best models real life data using regression • **Analyze and predict** an outcome using the quadratic function you found using regression
[Inverse Functions](#)	**SAT: Mathematics and Statistics** **SAT: High School** **Algebra I** **Objective AI.3.2** **Student represents and interprets simple exponential and quadratic functions based on mathematical and real-world phenomena using**	One to One Functions Determining Inverses Writing Inverses	• **Evaluate** e raised to the x • **Calculate** continuous compounded interest • **Write** and **evaluate** logarithmic expressions • **Identify** the properties of logarithms • **Simplify** logarithms

	tables, symbolic forms, or graphical representations and solves equations related to these functions. A I.3.2.1 Finds integer powers of rational numbers; evaluates the meaning of integer powers of variables in expressions, and applies the basic laws of exponents. **Algebra II** **Standard AII.2** **Exponential, Logarithmic, and Other Functions** **Objective AII.2.1** **Student represents geometric or exponential growth with exponential functions and equations, and applies such functions and equations to solve problems in mathematics and real-world contexts.** A II.2.1.1 Extends the properties of rational exponents to real exponents, relating expressions with rational exponents to the corresponding radical expressions. A II.2.1.3 Describes the effects of changes in the coefficient, base, and exponent on the growth described by an exponential function. **Objective AII.2.2** **Student defines logarithmic functions and uses them to solve problems in mathematics and real-world contexts.** A II.2.2.1 Defines a logarithm as a solution to an exponential equation, and recognizes the inverse relationship between functions defined by logarithms and exponential expressions, showing this relationship graphically. A II.2.2.2 Solves problems by applying properties of logarithms [log xy = log x + log y, log (x _ y) = log x – log y, and log(xa) = a log(x)] to construct equivalent forms of a logarithmic expression. A II.2.2.3 Applies the inverse relationship between exponential and logarithmic functions to solve problems in mathematics and real-world contexts.	Graphing Inverses Using Inverses to Code	• **Expand** logarithms • **Solve** exponential equations • **Solve** logarithmic • **Evaluate** a logarithm using Change of Base Formula • **Evaluate** natural logarithmic expressions • **Solve** a natural logarithmic equation • **Determine** growth factor • **Model** exponential growth • **Model** exponential decay • **Predict** outcomes using growth or decay functions • **Graph** exponential growth or decay • **Evaluate** items depreciation using exponential decay

	Precalculus **Objective PC.1.2** **Student examines and applies basic transformations of functions and investigates the composition of two functions in mathematical and real-world situations.** PC.1.2.2 Forms the composition of two functions, and determines the domain, range, and graph of the composite function. Composes two functions to determine whether they are inverses.		
[Logs and Exponents](#)		Exponential Equations Compound Interest Graphing Exponential Functions Graphing Logarithmic Functions Logarithmic Functions Properties of Logarithms	
[Senior Final Review](#)			
[Conic Sections](#)		Parabolas Circles Ellipses	

		Hyperbolas	

[Systems and Matrices](#)	**SAT: Mathematics and Statistics**
	  SAT: High School
	    Algebra II
	Standard AII.3
	Systems of Equations and Inequalities and Matrices
	Objective AII.3.1
	Student constructs, solves, and interprets solutions of systems of linear equations in two variables representing mathematical and real-world contexts.
	
	A II.3.1.2 Analyzes and explains the reasoning used to solve systems of linear equations in two variables.
	
	Objective AII.3.2
	Student represents and interprets cross-categorized data in matrices, develops properties of matrix addition, and uses matrix addition and its properties to solve problems.
	
	A II.3.2.1 Represents numerical or relational data categorized by two variables in a matrix and labels the rows and columns. Interprets the meaning of a particular entry in a matrix in terms of the labels of its row and column.
	
	AII.3.2.2 Uses matrix row and column sums to analyze data.
	
	A II.3.2.3 Develops the properties of matrix addition, and adds and subtracts matrices to solve problems.
	
	Objective AII.3.3
	Student multiplies matrices, verifies the properties of matrix multiplication, and uses the matrix form for a system of linear equations to structure and solve systems consisting of two or three linear equations in two or three unknowns, respectively, with technology.
		Types of Matrices - row, column, zero, identity
		
		Matrix Dimensions
		
		Finding Elements in Matrix Equations (solve for x)
		
		Adding & Subtracting Matrices
		
		Determinants
			• Identify Properties of Matrices
			• Evaluate Matrix Addition
			• Evaluate Matrix Subtraction
			• Evaluate Matrix Multiplication
			• Solve Systems of Matrices

	A II.3.3.1 Verifies the properties of matrix multiplication, and multiplies matrices to solve problems. A II.3.3.2 Constructs a system of linear equations modeling a real-world situation, and represents the system as a matrix equation. A II.3.3.3 Solves a system consisting of two or three linear equations in two or three unknowns, respectively, by solving the related matrix equation Ax = b, using technology to find x = A–1b.		
Sequences and Series	**SAT: Mathematics and Statistics** **SAT: High School** **Precalculus** **Standard PC.4** **Structure of Sequences and Recursion** **Objective PC.4.1** **Student categorizes sequences as arithmetic, geometric, or neither and develops formulas for the general terms and sums related to arithmetic and geometric sequences.** PC.4.1.2 Develops the general term for arithmetic and geometric sequences, and develops methods for calculating sums of terms for finite arithmetic and geometric sequences and the sum of a convergent infinite geometric series.		
Junior Final Review			