Trinity Area School District
Template for Curriculum Mapping

Course: PreCalculus Honors **Grade: 11 &12**	**Overview of Course** (Briefly describe what students should understand and be able to do as a result of engaging in this course)**:** PreCalculus completes the formal study of the elementary functions begun in Algebra 1 and Algebra 2. Students focus on the use of technology, modeling, and problem solving. Functions studied include polynomial, exponential, logarithmic, rational, radical, piece-wise, and trigonometric Functions and their inverses. Circles, Parametric equations, vectors, sequences and series are also studied.

Overarching Big Ideas, Enduring Understandings, and Essential Questions
(These "spiral" throughout the entire curriculum.)

Big Idea	**Standard(s) Addressed**	**Enduring Understanding(s)**	**Essential Question(s)**
Trigonometry	**CC.2.1.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions. **CC.2.1.HS.C.7** Apply radian measure of an angle and the unit circle to analyze the trigonometric functions. **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures. **CC.2.3.HS.A.7** Apply trigonometric ratios to solve problems involving right triangles. **CC.2.3.HS.A.8** Apply geometric concepts to model and solve real world problems. **CC.2.3.HS.A.9** Extend the concept of similarity to determine arc lengths and areas of sectors of circles. **CC.2.3.HS.A.11** Apply coordinate geometry to prove simple geometric theorems algebraically. **CC.2.3.HS.A.14** Apply geometric concepts to model and solve real world problems.	The six trigonometric functions of sine, cosine, tangent, cosecant, secant, cotangent can be used to find other trigonometric function values. When given a trigonometric function's value, all six trigonometric functions can be calculated. Angles that are measured in radians and degrees can be equivalent angles. Reference angles are helpful when drawing an angle, especially when the angle is large. The unit circle is used to define both the x value and the y value when determining the six trigonometric functions. Domain and range values are determined by the location on the unit circle. A graph could have the following characteristics transform (change or move) by altering a value in the sine or cosine equation: domain, range,	How are angles related? What is standard position for an angle? In what way can knowledge of triangles, trigonometry, and ratios help you in any way? How are trigonometric functions evaluated for any angle? How do you use the trigonometric function values used to calculate other trigonometric values for the same angle? Which trigonometric functions can be derived from another trigonometric function? How can circles be used to understand similar triangle relationships? How can a trigonometric identity or property be verified algebraically?

		period, x-intercept, y-intercept, minimum, and maximum. Trigonometric identities can be established by using other trigonometric identities via trigonometric proofs.	How are trigonometric identities used to solve a trigonometric problem?
Variable	**A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations). **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable. **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).	Quantities are used to form expressions, equations, and inequalities. An expression refers to a quantity by does not make a statement about it. An equation (or an inequality) is a statement about the quantities it mentions. Using variables in place of numbers in equations (or inequalities) shows the statement of relationships among numbers that are unknown or unspecified.	How do variables help you model real-world situations?
Properties	**A1.1.1.3.1** Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. **A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations). **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable. **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).	All of the facts of arithmetic and algebra follow from certain properties.	How can you use the properties of real numbers to simplify algebraic expressions?
Solving Equations and Inequalities	**A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations). **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).	Solving an equation is the process of rewriting the equation to make what it says about its variable(s) as simple as possible. Properties of numbers and equality can be used to transform an equation (or inequality) into equivalent, simpler equations (or inequalities) in order to find solutions. Useful information about equations and inequalities (including solutions) can be found by analyzing graphs or tables. The	How do you solve an equation or inequality? How are the properties of equality used in the solution of a system of equations? How are the real solutions of a quadratic equation related to the graph of the related quadratic function? For a polynomial equation, how are factors and roots related? When you square each side of an equation, how is the resulting equation related to the original?

	A1.1.3.1.2 Identify or graph the solution set to a linear inequality on a number line. **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation. **A2.1.3.1.1** Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). **A2.1.3.1.2** Solve equations involving rational and/or radical expressions.	numbers and types of solutions vary predictably, based on the type of equation.	
Equivalence	**A2.2.2.1.4** Translate from one representation of a function to another (graph, table, and equation). **A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function. **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.1.2.1.2** Simplify/evaluate expressions involving positive and negative exponents and/or roots (may contain all types of real numbers – exponents should not exceed power of 10). **A.2.1.1.1** Represent and/or use imaginary numbers in equivalent forms (e.g, square roots and exponents) **A.2.1.2.1** Use Exponents, roots, and/or absolute values to represent equivalent forms or to solve problems.	A single quantity may be represented by many different expressions. The facts about a quantity may be expressed by many different equations (or inequalities).	Which form of a linear equation should be used under what circumstances? How can writing equivalent equations help you solve a system of equations? What are the advantages of a quadratic function in vertex form? In standard form? For a polynomial function, how are factors, zeros, and x-intercepts related? To simplify the nth root of an expression, what must be true about the expression? How are exponents and Logarithms related?
Functions	**A1.2.1.1.2** Determine whether a relation is a function, given a set of points or a graph.	A function is a relationship between variables in which each value of the input variable is	How do you use transformations to help graph all functions?

	A2.2.1.1.4 Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function. **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and/or interpret minimum and maximum values over a specified interval of a graph of a function. **A2.2.2.1.4** Translate from one representation of a function to another (graph, table, and equation). **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions. **A2.1.3.1** Write and/or solve non-linear equations using various methods including Quadratic, rational, radical, exponential, logarithmic and Trigonometric Functions.	associated with a unique value of the output variable. Functions can be represented in a variety of ways, such as graphs, tables, equations, or words. Each representation is particularly useful in certain situations. Some important families of functions are developed through transformations of the simplest form of the function.	How does representing functions graphically help you solve a system of equations? How is any function related to the parent function (for example, $y = x^2$)? What does the degree of a polynomial tell you about its related polynomial function? How are exponential and logarithmic functions related? How are a function and its inverse related?
Modeling	**A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. **A2.1.3.1.4** Write, solve and/or apply linear or exponential growth or decay problem situations.	Many real-world mathematical problems can be represented algebraically. These representations can lead to algebraic solutions. A function that models a real-world situation can then be used to make estimates or predictions about future occurrences. Many real-world mathematical problems can be represented graphically.	How can you model data with a linear, quadratic, exponential, logarithmic and trigonometric functions?
Proportionality	**M11.A.2.1.2** Solve problems using direct and inverse proportions. **M11.D.4.1.1** Match the graph of a given function to its table or equation. **A2.1.3.2** Describe and /or determine change. **A2.1.3.2.1** Determine how a change in one variable relates to a change in a second variable.	Some quantities are in a relationship where the ratio of corresponding values is constant. Many types of physical phenomena exhibit direct variation such as rates (Miles per hour, miles per gallon, etc.). In a direct variation, two positive quantities either increase together or decrease together. In an inverse variation, as one quantity increases the other decreases (For example, Supply and Price).	Are two quantities inversely proportional if an increase in one corresponds to a decrease in the other? What kids of asymptote are possible for a rational function? Are a rational expression and its simplified form equivalent? Describe real world applications of vary directly, are inversely proportional and are jointly proportional.
Patterns	**A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable.	Patterns can be used to generalize explicitly defined and recursively defined functions.	How can you extend algebraic properties and processes to quadratic, exponential and

		Functions of one or two variables can be analyzed by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior; these attributes can be found using patterns. Patterns can be used to understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, and using technology to perform such operations on more-complicated symbolic expressions; Patterns are used to understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions and to interpret representations of functions in two variables.	polynomial expressions and equations and then apply them to solve real world problems? What are the advantages/disadvantages of the various methods to represent exponential functions (table, graph, equation) and how do we choose the most appropriate representation? How do quadratic equations and their graphs and/or tables help us interpret events that occur in the world around us? How do you explain the benefits of multiple methods of representing polynomial functions (tables, graphs, equations, and contextual situations)?

Big Ideas, Enduring Understandings, and Essential Questions Per Unit of Study
(These do NOT "spiral" throughout the entire curriculum, but are specific to each unit.)

Month of Instruction	**Title of Unit**	**Big Idea(s)**	**Standard(s) Addressed**	**Enduring Understanding(s)**	**Essential Question(s)**	**Common Assessment(s)***	**Common Resource(s)* Used**
August	Review of Summer Work (Skills Handbook from Algebra 1 and 2 books and Pretest) Literal Equations and Formulas	Equivalence, Function, and Modeling	**A1.1.2.1.1** Write, solve, and/or apply a linear equation (including problem situations). **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable. **A1.1.3.1.1** Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value	A literal equation is an equation that uses at least two different letters as variables. You can solve a literal equation for any one of its variables by using the properties of equality. You solve for a variable "in terms of" the other variables. The set of real numbers has several subsets related in particular ways.	How is solving a literal equation like solving an equation containing one variable? How does re-writing a formula aid in solving for a particular variable?	**Terminology:** Literal equation Inverse properties Reflexive Property Symmetric Property Transitive Property Substitution **Assessments:** Participation Homework Literal Equation Handouts and Quiz In-Class Work	*Precalculus, Blitzer, 2004*– Prerequisite 7 Algebra 2, Prentice Hall Mathematics, 2007, p. 874

			inequalities). **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable.	You can represent some mathematical phrases and real-world quantities using algebraic expressions. You can use the properties of equality and inverse operations to solve equations. Sometimes, no value of the variable makes an equation true. For identities, all values of the variable make the equation true. Just as you use properties of equality to solve equations, you can use properties of inequality to solve inequalities. An absolute value quantity is nonnegative. Since opposites have the same absolute value, an absolute value equation can have two solutions.		Projects/Activities Midterm Summer Review Test	
September **Teacher Note: Do 1.4 through 1.6 Prior to 4.5**	Trigonometric, Functions and Models	Patterns, Functions and Modeling	**A2.1.3.2.2** Use algebraic processes to solve a formula for a given variable. **CC.2.1.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions. **CC.2.1.HS.C.7** Apply radian measure of an	The characteristics of trigonometric and circular functions and their representations are useful in solving real-world problems. Periodic behavior is behavior that repeats over intervals of constant length.	How do trigonometric and circular functions model real-world problems and their solutions? How are the circular functions related to the trigonometric functions? How can you model periodic behavior?	**<u>Terminology</u>** Amplitude Arc Length Central Angel Cosecant Cosine CoFunction Cotangent Coterminal Angle Cycle Degrees	*<u>Precalculus, Blitzer, 2004</u>* – Chapter 4 *<u>Algebra 2</u>, Prentice Hall Mathematics, 2007*, Chapter 13 SOHCAHTOA Jokes Finger Trick for Trig

			angle and the unit circle to analyze the trigonometric functions. **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures. **CC.2.3.HS.A.7** Apply trigonometric ratios to solve problems involving right triangles. **CC.2.3.HS.A.8** Apply geometric theorems to verify properties of circles. **CC.2.3.HS.A.9** Extend the concept of similarity to determine arc lengths and areas of sectors of circles. **CC.2.3.HS.A.11** Apply coordinate geometry to prove simple geometric theorems algebraically. **CC.2.3.HS.A.14** Apply geometric concepts to model and solve real world problems. **G.1.1.1** Identify and/or use parts of circles and segments associated with circles, spheres, and cylinders. **G.1.1.1.1** Identify, determine, and/or use the radius, diameter,	The measure of an angle in standard position is the input for two important functions. The outputs are the coordinates (called the cosine and sine) of the point on the terminal side of the angle that is one unit form the origin. An angle with a full circle rotation measures 2π radians or 360^{o}. Degrees and Radians are two different units of measure used to classify angles. When graphing, you can translate periodic functions in the same way that you translate other functions. The amplitude of a periodic function is half the difference of the maximum and minimum values of the function. SOHCAHTOA and the Pythagorean Theorem are used to solve for missing angles and sides in a Right Triangle. The values of the sine, cosine and tangents are special triangle ratios. The period of the Tangent and Cotangent is $\frac{\pi}{b}$. All	What is the relationship between the Pythagorean Theorem and the Trigonometric Functions? What function has as its graph a sine curve with amplitude 4, Periodπ, and a minimum at the origin? If you know the value of sin θ, how can you find cos θ, tan θ, csc θ, sec θ and cot θ? How do we use transformations to graph functions? How do we convert degrees to radians and back? How do you graph the basic trigonometric functions on the coordinate plane? How is Right Triangle Trig used to solve right triangles? How the unit circle used to describe trigonometric functions? How do you graph the basic trigonometric functions on the coordinate plane?	Initial side Intercepted arc Midline Period Periodic function Phase shift Radian Reciprocal Reciprocal Trig Function. Right Triangle Trig Trigonometric Ratios Secant Sine Special Triangles Standard Position Tangent Terminal Side Unit Circle Inverse of a function Domain Range Transformations Maximum Minimum **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	http://www.mangahigh.com/en_us/maths_games/shape/trigonometry/use_trigonometry_to_find_angles Unit Circle Games http://www.purposegames.com/game/unit-circle-quiz http://www.purposegames.com/game/angles-of-the-unit-circle-radians-quiz Flashcards: http://quizlet.com/1699330/unit-circle-quiz-flash-cards/ Unit Circle Tutorial http://htmartin.mywebb.uga.edu/6190/Projecthome.html Math is Fun!! http://www.mathsisfun.com/geometry/unit-circle.html Angles of Elevation and Depression http://www.mathsteacher.com.au/year10/ch15_trigonometry/12_

			segment, and/or tangent of a circle. **G.1.1.1.2** Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle. **G.1.2.1.1** Identify and/or use properties of triangles. **G.1.2.1.3** Identify and/or use properties of isosceles and equilateral triangles. **G.2.1.1** Solve problems involving right triangles. **G.2.1.1.1** Use the Pythagorean theorem to write and/or solve problems involving right triangles. **G.2.1.1.2** Use trigonometric ratios to write and/or solve problems involving right triangles. Identify cycles, periods and amplitude of periodic functions Graph periodic functions.	other trig functions have a period of $\frac{2\pi}{b}$. Describe which trigonometric functions are odd and which are even and how you know which is odd or even. Two angles in standard position are coterminal angles if they have the same terminal side. Arc length = radius times angle (in radians) or $s = r\vartheta$. The six trigonometric functions of sine, cosine, tangent, cosecant, secant, cotangent can be used to find other trigonometric function values. The trigonometric functions of sine, cosine, tangent, cosecant, secant, and cotangent can be used to find a missing side or angle of a right triangle. The unit circle is used to define both the x value and the y value when determining the six trigonometric functions. Domain and range values are determined by the location on the unit circle. A graph could have the following characteristics	How do you restrict a trigonometric function to allow its inverse to be constructed? Why must you restrict the sine, cosine and tangent for the inverses? How do trigonometric and circular functions model real-world problems and their solutions? What is the difference between the reciprocal and cofunctional relationships for trigonometric functions? How do you determine the period and amplitude of trigonometric function without looking at the graph of the function? In what way can knowledge of triangles, trigonometry, and ratios help you in any way? Why would knowledge of triangle trigonometry be of any use to a pilot, a navigator, and a surveyor? Is there a way to determine the area and/or angles of any		elevation_depression/23elevdep.htm Angles of Elevation and Depression Activity http://www.mathwarehouse.com/geometry/angle/elevation_depression/creepy_eyes_activity.htm Graphing: http://illuminations.nctm.org/ActivityDetail.aspx?ID=174 OR http://www.geogebra.org/en/upload/files/couture_daniel/TrigFunctions.html OR http://www.mathsisfun.com/algebra/trig-sin-cos-tan-graphs.html http://www.slidermath.com/rpoly/Trigapps.shtml http://www.teachmaths-inthinking.co.uk/activities/sine-cosine-model-waves.htm

				transform (change or move) by altering a value in the sine or cosine equation: domain, range, period, *x*-intercept, *y*-intercept, minimum, and maximum. The tangent function has infinitely many points of discontinuity with a vertical asymptote at each point. Its range is all real numbers. Its period is π, half of that of both the sine and cosine functions. Cosine, sine, and tangent have reciprocals. Functions and graphs form the basis for understanding mathematics and applications. Functions and graphs form the basis for understanding mathematics and applications. Trigonometric functions can be used to model periodic behavior and applications, such as tides and musical notes.	triangle when given only the lengths of the three sides? Why does any trigonometric value of any angle of a specific triangle remain the same regardless of the unit of measure? How can circles be used to understand similar triangle relationships? How can the coordinates of a circle of radius = 1 centered on the origin be used to evaluate all trigonometric function values? How are the graphs **sine**, **cosine**, and tangent **graphs** transformed and translated? How can the domain and range be defined for the 6 trigonometric functions? Is there a restrictive domain for all trigonometric functions? How are the trigonometric functions' graphs evaluated based on the unit circle?		https://www.explorelearning.com/index.cfm?method=cResource.dspExpGuide&ResourceID=286 Graphing Activity http://www.projectmaths.ie/documents/Exploring_Trignometric_Graphs.pdf.pdf OR http://www.carlisleschools.org/webpages/wolfer/applied.cfm?subpage=1323956 Arc Length Activity (on Math Drive Chap 4) Biorhythm Graphing (Sine): http://www.intmath.com/trigonometric-graphs/biorhythm-graphs.php OR http://education.ti.com/en/us/activity/detail?id=1142FF8DF9FC4BD586098B7080E5AFC1 Cosine Graphing Activities

					Why do some, but not all, of the trigonometric functions have asymptotes? How can you use the reciprocals to graph the reciprocal functions of the sine, cosine and tangent? What are the relationships between the Pythagorean Identities for Trigonometry		http://www.teachmaths-inthinking.co.uk/activities/sine-cosine-model-waves.htm OR https://www.explorelearning.com/index.cfm?method=cResource.dspExpGuide&ResourceID=286 OR http://spot.pcc.edu/~chughes/geogebra/graphingCosandSin.html OR http://education.ti.com/en/us/activity/detail?id=8B94C370E6AB4F999F7900CB316D7CB2 OR http://www.ehow.com/how_2249326_do-trigonometry.html OR http://catcode.com/trig/trig08.html OR http://www.explorelearning.com/index.cfm?method=cResource.dspStandardCorrelation&id=1264 Exploring the Inverse Trig Function

							Activity on the Graphing Calculators 1.6 Activity – Exploring Transformations of Graphs
October -	Vectors	Equivalence, Functions, Modeling	**A1.1.2.1.3** Interpret solutions to problems in the context of the problem situation. **A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.2.1.4** Translate from one representation of a function to another (graph, table, and equation). **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions. **A2.2.3.1.1** Draw, identify, find, interpret, and/or write an equation for a regression model (lines and curves of best fit) for a scatter plot. Represent scalar multiplication graphically by scaling vectors….perform scalar multiplication component-wise. **A.2.3.1.2** Make	A vector is a mathematical object that has both magnitude and direction. Vectors can be added or subtracted by adding or subtracting corresponding elements. The dot product of two vectors is the sum of the products of corresponding elements. A vector's magnitude and direction can be described geometrically by a directed line segment and algebraically in component form or matrix form. Many physical concepts can be represented by vectors including direction and speed of moving objects and when those objects are being acted upon by outside objects (e.g., airplanes and wind, boats and currents). The dot product and magnitude can be used to	How do you determine the amount of work done by moving your car 1 mile when you have run out of gas? If an airplane is heading due north at 575 miles per hour encounters a wind of 75 miles per hour blowing in an easterly direction, what is the speed and actual direction of the plane? Why are functions and relations represented by vectors? What is the difference between vectors and rays? How do you find the dot product of two vectors? What are equal vectors? What is a position vector? How can you represent a position vector using **i** and **j**? What is the zero vector?	**Terminology** Vector Quantities Scalar Quantities Directed Line Segment Magnitude Equal Vectors Scalar Multiplication Resultant Vector Horizontal and Vertical Component *i* & *j* unit vectors zero vector Unit Vector Position Vector Velocity Vector Force Vector Dot Product Orthogonal Vectors **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	*Precalculus, Blitzer, 2004* – Sections 6.6 – 6.7 Vector activities: http://www.explorelearning.com/index.cfm?method=cResource.dspStandardCorrelation&id=1510 http://phet.colorado.edu/en/simulation/vector-addition http://phet.colorado.edu/en/contributions/view/2844 http://illuminations.nctm.org/ActivityDetail.aspx?ID=42 http://www.teachmaths-inthinking.co.uk/activities/dancing-vectors.htm

			predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots. **G.1.2.1.1** Identify and/or use properties of triangles. **G.2.2.1.1** Use properties of angles formed by intersecting lines to find the measures of missing angles. **G.2.2.1.2** Use properties of angles formed when two parallel lines are cut by a transversal to find the measures of missing angles.	find the angle between two vectors and work done by a force moving an object from place A to place B. Magnitude is the same as velocity and speed. Functions and graphs form the basis for understanding mathematics and applications. The jump from one to two dimensions (and eventually higher) is easier than one might think, thanks to the mathematics of vectors.	How do you find the unit vector in the direction of any give vector? How do you write a vector in terms of its magnitude and direction? Why is it difficult to hold a heavy stack of books perfectly sill for a long period of time? As you become exhausted, what eventually happens? What does this mean in terms of the forces acting on the books? What term, used with lines, means the same thing as "orthogonal"? What is one way in which the everyday use of the word "work" is different form the definition of work in physics?		http://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_navigation/cub_navigation_lesson02_activity1.xml
November (week 1 - Review from Alg 1 and 2)	Linear Functions	Functions, Equivalence, Solving Equations & Inequalities	**A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions.	Solving an equation is the process of rewriting the equation to make what it says about its variable(s) as simple as possible. Properties of numbers and equality can be used to transform an equation (or inequality) into	How are linear models used to solve real world situations? What are the similarities and differences between solving a linear equation compared to a linear inequality?	**Terminology:** Linear equation Linear inequality Domain Range **Assessments:** Participation	*Algebra 2, Prentice Hall Mathematics, 2007* (Chapter 1 and 2) *Precalculus, Blitzer, 2004* – Sections P7, P9, Sections 1.1-1.4

			A2.2.3.1.1 Draw, identify, find, interpret, and/or write an equation for a regression model (lines and curves of best fit) for a scatter plot. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots. **G.2.1.2.2** Relate slope to perpendicularity and/or parallelism (limit to linear algebraic equations). **G.2.1.3.1** Apply the concept of the slope of a line to solve problems.	equivalent, simpler equations (or inequalities) in order to find solutions. Useful information about equations and inequalities (including solutions) can be found by analyzing graphs or tables. The numbers and types of solutions vary predictably, based on the type of equation. Linear Equations are used extensively in Business and economic applications. Functions and graphs form the basis for understanding mathematics and applications.	How is the domain and range of a function determined from the graph of a linear function?	Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	**1.4** Determine the domain, range, and end behavior of radical functions. *https://finitemathematics.wikispaces.hcpss.org/Unit+7+Radicals,+Special+Functions,+and+Parametrics*
November Week 1	Piecewise Functions, Domain, Range	Functions, Equivalence, Modeling	**A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots.	A piecewise function is used when the RULES change. For example, if a company charges different amounts based on usage, or a company pays different commissions based on amounts sold. Functions and graphs form the basis for understanding mathematics and applications.	How are absolute value models used to solve real world situations? What is important when evaluating a piecewise function? Why are they called piecewise functions? What real-life situations are examples of piecewise functions?	**Terminology:** Piecewise Function Domain Range Step Function Maximum on a graph Minimum on a graph Vertical Line Test **Assessments:** Participation Homework Quizzes/Tests In-Class Work	*Algebra 2, Prentice Hall Mathematics, 2007* (page 90-91)) *Precalculus, Blitzer, 2004* –Sections 1.4 Piecewise Activities on the math drive – Exercise, Cell Phone plans, extra word problems

						Projects/Activities Midterm	
November Weeks 2 - 4	Circles, Midpoint, Distance, Combining Functions, Compositions, Inverses, Difference Quotient Domain and Range of Compositions, combinations, Inverse Functions, Variations, Modeling with Functions	Functions, Equivalence, Modeling, Coordinate Geometry, Solving Equations and Inequalities, Proportionality Functions Models,	**A2.2.1.1.3** Determine the domain, range, or inverse of a relation. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots. **G.1.1.1.1** Identify, determine, and/or use the radius, diameter, segment, and/or tangent of a circle. **G.1.1.1.2** Identify, determine, and/or use the arcs, semicircles, sectors, and/or angles of a circle. **G.1.3.1.2** Identify and/or use proportional relationships in similar figures. **G.2.1.2.3** Use slope, distance, and/or midpoint between two points on a coordinate plane to establish properties of a 2-dimensional shape. **G.2.1.2.1 Calculate** the distance and/or midpoint between two points on a number line or on a coordinate plane.	An equation of a circle with center (0, 0) and radius r in the coordinate plane is $x^2 + y^2 = r^2$. In an $x - y$ relationship replacing x by $x - h$ and y by $y - k$ translates the graph of the relation h unites to the right and k units up. A circle is a set of points a fixed distance from one point (the center). A single quantity may be represented by many different expressions. The facts about a quantity may be expressed by many different equations. The inverse of a function may or may not be a function. The composite of a function and its inverse must equal x (or you made a mistake). The range of a relation is the domain of the inverse. The domain of the relation is the range of the inverse. Functions can be added, subtracted, multiplied and divided based on how these operations are	How is the domain and range of a function determined from the graph of any function? What is the algebraic process that is used to find the inverse of a function? What happens when you transform a parent function? What is the difference between an even and odd function? What is the difference between the standard and general for of the equation of a circle and how do you convert from one form to the other? How are a function and its inverse function related? How can you graph an inverse if you have the graph of the original function? How do compositions relate to translations? What are the differences and similarities between the Horizontal and Vertical Line tests?	**Terminology:** Circle Complete the Square Midpoint Distance Formula Inverse of a function Domain Range Transformations Parent Function Composition Combination Even vs. Odd Functions One-to- One Horizontal Line Test Direct Variation Inverse Variation Joint Variation Combined Variation Constant of Variation Difference Quotient **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities	*Algebra 2*, *Prentice Hall Mathematics, 2007* - Sections 10.3, 6.6, 6.7, 8.1 *Precalculus, Blitzer, 2004* –Sections 1.3 and 1.7 **1.7** Exploring Functions and Their Inverses Activity on Graphing Calculator **1.8** Crickets: Natures Thermometer Activity **1.9** Activity – Discovery the maximum volume of Open Top Boxes Variation Videos: http://www.onlinemathlearning.com/polynomial-functions.html Inverse Functions for students: http://www.mathwarehouse.com/algebra/relation/inverse-of-function.php

				performed for real numbers. One difference, however, is that the domain of each function must be considered. Two quantities are proportional if they have the same ratio in each instance where they are measure together. Two quantities are inversely proportional if they have the same produce in each instance where they are measure together. NOTATION is important. TERMINOLGY is important. Functions and graphs form the basis for understanding mathematics and applications.	What does one-to-one mean? When writing variation problems, where do you ALWAYS place the Constant of Variation? What is the difference between a direct and inverse variation problem? Are two quantities inversely proportional if an increase in one corresponds to a decrease in the other? Are two quantities directly proportional if an increase in one corresponds to a decrease in the other? How can you determine from a table the Constant of Variation? How do variation problems relate to Literal equations?	Midterm	Inverse Graphing Calculator: http://education.ti.com/en/us/activity/detail?id=1EA779FD234F4E1A9B945302C9BDB739 Videos: http://education.ti.com/en/us/activity/detail?id=1EA779FD234F4E1A9B945302C9BDB739
A Short week – use before a break when time	Absolute Value equations and Inequalities Compound inequalities	Equivalence, Functions, and Solving Equations and Inequalities		Absolute value is a DISTANCE from zero. Absolute Value Equalities and inequalities require two equations. And vs. Or When solving absolute value equations or inequalities, extraneous	How are absolute value models used to solve real world situations? What is the difference between an expression and an equation? What is the difference between an equation and an inequality?	**Terminology:** Absolute Value Compound inequality **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities	*Algebra 2*, *Prentice Hall Mathematics, 2007* – Chapter 1 *Precalculus, Blitzer, 2004* –Sections 2.1-2.2 And P. 9 Exploring Inequalities Activity

				solutions may be introduced. Functions and graphs form the basis for understanding mathematics and applications.		Midterm TEACHER NOTE: Treat as REVIEW – after test activities	Graphically on Graphing Calculator http://education.ti.com/en/us/activities/explorations-series-books/activitybook_inequalgraphapp_exploring Games: http://crctlessons.com/absolute-value-equations-game.html http://www.sheppardsoftware.com/mathgames/Numberballs_absolute_value/numberballsAS2_abs.htm http://www.math-play.com/Absolute-Value-Equations/Absolute-Value-Equations.html Activity Ideas: http://www.ehow.com/info_8469510_activities-solve-absolute-value-equations.html Tutorial: http://www.purplemath.com/modules/solveabs.htm

							Videos: http://www.onlinemathlearning.com/absolute-value-equations-algebra.html
December	Quadratic Equations & Functions	Equivalence, Functions, and Solving Equations and Inequalities	**A2.1.1.1.1** Simplify/write square roots in terms of I. **A2.1.1.1.2** Simplify/evaluate expressions involving powers of i. **A2.1.1.2.1** Add and subtract complex numbers. **A2.1.1.2.2** Multiply and divide complex numbers. **A2.1.3.1.1** Write and/or solve quadratic equations (including factoring and using the Quadratic Formula). **A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function. **A2.2.2.1.1** Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and/or interpret minimum and maximum values over a specified	Three noncollinear points, no two of which are in line vertically, are on the graph of exactly one quadratic function. For any quadratic function $f(x) = ax^2 + bx + c$, the values of a, b, and c, provide key information about its graph. The graph of any quadratic function is a transformation of the graph of the parent quadratic function $f(x) = ax^2$ You can factor many quadratic trinomials ($ax^2 + bx + c$) into products of two binomials. To find the zeros of a quadratic function $f(x) = ax^2 + bx + c$, solve the related quadratic equation $0 = ax^2 + bx + c$. The complex numbers are based on a number whose square is -1. Completing a perfect square trinomial allows	How are quadratic models used to solve real world situations? What are the advantages of a quadratic function in vertex form? In standard form? How is any quadratic function related to the parent quadratic function $y = x^2$? How are the real solutions of a quadratic equation related to the graph of the related quadratic function? How are factors related to Zeros? What is the difference between a solution and a zero? How do you find the conjugate of a complex number?	**Terminology:** Quadratic Functions Vertex Form Standard Form Zeros y-intercepts Solutions Factors Axis of symmetry Complex number Conjugate Discriminant GCF LCM Imaginary number Parabola Quadratic Formula Quadratic Function Vertex Coefficient **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	*Algebra 2*, *Prentice Hall Mathematics, 2007* – Chapter 4 *Precalculus, Blitzer, 2004* –Sections 2.1-2.2 And P. 4 – P.6 Investigating Quadratic Functions Activity on Graphing Calculator http://a4a.learnport.org/forum/topics/investigating-graphs-of http://education.ti.com/en/us/activity/detail?id=519B1FC7C13D4B9EAAE5142030CB1400 Another One on math drive **2.2** Quadratic Function Activity http://www.drphilclark.com/MAT150/hybrid/Activities/Q

			interval of a graph of a function. **A2.2.2.2.1** Identify or describe the effect of changing parameters within a family of functions. **A2.2.3.1.1** Draw, identify, find, interpret, and/or write an equation for a regression model (lines and curves of best fit) for a scatter plot. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots. **ADD:** Represent complex numbers and their operations on the complex plane.	you to factor the completed trinomial as the square of a binomial. You can solve a quadratic equation $0 = ax^2 + bx + c$ in more than one way. In general, you can find a formula that gives values of x in terms of a, b, and c. Functions and graphs form the basis for understanding mathematics and applications.			uadratic%20Functions%20Activity.pdf Soda Pop Activity Activity in the real world: http://www.thefutureschannel.com/algebra/quadratic_equations_functions.php Plumbers and Helpers Activity: http://jwilson.coe.uga.edu/emt669/Student.Folders/Jeon.Kyungsoon/IU/quadratic/Activity1.html Interactive: http://www.shodor.org/interactivate/textbooks/section/351/ http://www.regentsprep.org/Regents/math/ALGEBRA/AC5/TGraphFunc.htm
January – Week 1 and 2	Polynomials and Polynomial Functions	Functions, Equivalence, Solving Equations and Inequalities	**A2.2.1.1.4** Identify and/or determine the characteristics of an exponential, quadratic, or polynomial function.	A polynomial function has distinguishing "behaviors." You can look at its algebraic form and know something about its graph. You can	How are polynomial models used to solve real world situations? What does the degree of a polynomial tell you	**Terminology:** End Behavior Intermediate Value Theorem Remainder Theorem Multiplicity	*Algebra 2*, *Prentice Hall Mathematics, 2007* – Chapter 5

			A2.2.2.1.1 Create, interpret, and/or use the equation, graph, or table of a polynomial function (including quadratics). **A2.2.2.1.3** Determine, use, and/or interpret minimum and maximum values over a specified interval of a graph of a function. **A2.2.3.1.1** Draw, identify, find interpret, and/or write an equation for a regression model (lines and curves of best fit) for a scatter plot. **A2.2.3.1.2** Make predictions using the equations or graphs of regression models (lines and curves of best fit) of scatter plots.	look at its graph and know something about its algebraic form. Finding the zeros of a polynomial function will help you factor the polynomial, graph the function, and solve the related polynomial equation. You can divide polynomials using steps that are similar to the long division steps that you use to divide whole numbers. If $(x - a)$ is a factor of a polynomial, then the polynomial has value 0 when $x = a$. If a is a real number, then the graph of the polynomial has $(a, 0)$ as an x-intercept. You can use a pattern of coefficients and the pattern a^n, a^{n-1} b, a^{n-2} b^2,…, a^2b^{n-2}, ab^{n-1}, b^n to write the expansion of $(a + b)^n$. Functions and graphs form the basis for understanding mathematics and applications. What is the procedure to find real zeros of a polynomial function?	about its related polynomial function? For a polynomial function, how are factors, zeros, and x-intercepts related? For a polynomial equation, how are factors and roots related? How can you use the Binomial theorem to expand binomials?	Relative maximum Relative Minimum Polynomial Function Binomial Theorem Pascal's Triangle Synthetic division Turning Points The Fundamental Theorem of Algebra Conjugate Conjugate Roots Rational Root Theorem Synthetic Division Long Division of Polynomial Functions **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	*Precalculus, Blitzer, 2004* –Sections 2.3 – 2.5 Introduction: http://illuminations.nctm.org/LessonDetail.aspx?ID=L282 Graphing Calculator: http://education.ti.com/en/us/activity/detail?id=37042B8F036C410C91693D1652B7EC9E Activity Ideas: http://www.ehow.com/list_6111750_activities-operations-polynomials.html Roller Coaster: http://www.thefutureschannel.com/algebra/polynomial_roller_coasters.php Puzzler: http://illuminations.nctm.org/LessonDetail.aspx?id=L798 Videos:

							http://www.onlinemathlearning.com/polynomial-functions.html
January Week 3 and 4	Radical and Rational Exponents, Equations and Functions	Equivalence, Solving Equations & Inequalities, Functions	**A2.1.2.1.1** Use exponential expressions to represent rational numbers. **A2.1.2.1.2** Simplify/evaluate expressions involving positive and negative exponents and/or roots (may contain all types of real numbers – exponents should not exceed power of 10). **A2.1.2.1.3** Simplify/evaluate expressions involving multiplying with exponents, powers of powers, and powers of products. (Limit to rational exponents.) **A2.1.3.1.2** Solve equations involving rational and/or radical expressions.	to every power, there is a root. For example, just as there are squares (second powers), there are square roots. Just as there are cubes (third powers), there are cube roots, and so on. You can simplify a radical expression when the exponent of one factor of the radicand is a multiple of the radical's index. You can combine like radicals using properties of real numbers. You can write a radical expression in an equivalent form using a fractional (rational) exponent instead of a radical sign. Solving a square root equation may require that you square each side of the equation. This can introduce extraneous solutions. You can add, subtract, multiply, and divide functions based on how you perform these operations for real	How are radical and rational models used to solve real world situations? To simplify the nth root of an expression, what must be true about the expression? When you square each side of an equation, how is the resulting equation related to the original? How do you undo a 2/3 power? How do you simplify an expression like $4^{3/2}$ without a calculator? What kinds of asymptotes are possible for a rational function? Are a rational expression and its simplified form equivalent?	**Terminology:** n^{th} Root Radical equation Rational exponent Rational equation Radicand Rationalize the denominator Square Root Equation Square Root Function Complex Fraction Continuous Graph Asymptotes Point of Discontinuity Reciprocal Function Slant Asymptote Vertical Asymptotes Horizontal Asymptotes **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities	Algebra 2, Prentice Hall Mathematics, 2007 – Chapter 6 and 8 and page 550-551 (Rational Inequalities) *Precalculus, Blitzer, 2004* –Sections 2.6–2.8 and P.2, P. 3 & P.6 Videos: Simplifying Radicals http://www.onlinemathlearning.com/simplify-radicals.html Graphing Radical Functions http://www.onlinemathlearning.com/graph-radical-equations.html Interactive: Radical Functions with activity: http://teachers.henrico.k12.va.us/math/ito_08/04Rational/4-5RadicalEqn.html

				numbers. One difference, however, is that you must consider the domain of each function. When solving Radical or rational equations, extraneous solutions may be introduced. A rational function is a ratio of polynomial functions. If a rational function can be simplified, it has asymptotic behavior. Transformation behavior is consistent regardless of the parent function. Functions and graphs form the basis for understanding mathematics and applications.		Final	Solving Radical Functions: http://www.onlinemathlearning.com/equations-radicals.html Rational Function Activity http://illuminations.nctm.org/LessonDetail.aspx?id=L606 http://users.stlcc.edu/amosher/MTH185RationalFunctions.htm http://untilnextstop.blogspot.com/2010/11/rational-functions-fun.html (click on links) Solving Rational Equations activity http://pdesas.org/module/content/resources/13777/view.ashx Graphing Rational Equations http://www.hamilton.k12.nj.us/webpages/ishari/di.cfm?subpage=1015900

							http://education.ti.com/en/us/activity/detail?id=208097E06E214A0AA651CB7BF559C29A Other activities at http://a4a.learnport.org/forum/topics/graphing-rational-functions?xg_source=activity
February	Exponential and Logarithmic Functions	Simple Interest, Compound Interest, Modeling, Equivalence, Functions	**CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.	Present value and future value are compared and contrasted through examples. Simple interest is used to determine values of loans and savings. Continuously compounding interest is used to determine values of loans and savings. Logarithms and Exponential Functions are inverses. Consequently, you can use the inverse to solve equations of the original function. You graph a logarithmic function by graphing its inverse and using the definition of an inverse. When solving logarithmic equations, extraneous	How are exponential and logarithmic models used to solve real world situations? What do the various parts of the simple interest formula mean? How does value increase with simple interest? What do the various parts of the compound interest formula mean? How does value increase with compound interest compared to simple interest? How is continuously compounded interest different than compound interest?	**Terminology:** Present Value Future Value Discounted Loan Simple Interest Compound Interest Effective Annual Yield Exponential Function Logarithm Function Properties of Logarithms Inverse Functions One-to-One Function Asymptotes Change of Base Common Logarithm Exponential Growth and Decay The number *e* Natural Logarithm Change of Base property	*Precalculus, Blitzer, 2004* –Chapter 3 *Algebra 2, Prentice Hall Mathematics, 2007* - Chapter 7 http://www.investor.gov/tools/calculators/compound-interest-calculator 3.2 Activity – Exploring the value of the number e. Earthquake activity and other activities on math drive http://juliatsygan.blogspot.com/2010/12/my-

				solutions may be introduced. Functions and graphs form the basis for understanding mathematics and applications.	Which gives a larger return: simple interest, compound interest, or continuously compounded interest? How does an earthquake of magnitude 5.2 compare to an earthquake of magnitude 7.4? If a substance is decaying at a certain rate, how do you determine how much of the substance is left at any point in time? If you know the decay rate of an article made of a particular substance and how much is left after a certain period of time, how do you determine how old the article is? How do you graph a logarithmic function? How do you model a quantity that changes regularly over time by the same percentage? How are exponents and logarithms related? How are exponential functions and logarithmic functions related?	**Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Final	intro-to-logarithms.html http://mathmamawrites.blogspot.com/2010/04/murder-mystery-project-for-logarithms.html http://serc.carleton.edu/quantskills/methods/quantlit/logarithms.html#teaching

March – Week 1 and 2	Law of Sines and Cosines, Area of Oblique Triangles	Functions, Equivalence, Solving Equations, Proportionality	**No CC standards:** Solve and find the area of Oblique Triangles Explore the SSA Ambiguous case of Oblique Triangles	There are formulas for finding the area of an oblique triangle if you know two sides and an included angle of a triangle or if you know all three side lengths. You can completely solve oblique triangles using the Law of Cosines or the Law of Sines. Functions and graphs form the basis for understanding mathematics and applications.	What formulas are used to solve for missing sides and angels of right triangles? What formulas are used to solve for missing sides and angels of oblique (non-right) triangles? How do the trigonometric functions relate to the trigonometric ratios for a right triangle? What is meant by Ambiguous Case and when under what circumstances does an ambiguous case occur? How do you determine whether to use the Law of Sines or the Law of Cosines? Do the Law of Sines and/or the Law of Cosines work with Right Triangles? When is it necessary to use the Law of Sines to solve a triangle?	**Terminology:** Law of Sines Law of Cosines Trigonometric Ratios Heron's formula Ambiguous Case **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Final	*Algebra 2*, *Prentice Hall Mathematics, 2007* Section 14.4 & 5 *Precalculus, Blitzer, 2004* –Sections 6.1 and 6.2 Law of Sines and Cosines *http://illuminations.nctm.org/LessonDetail.aspx?ID=U177* For Students: *http://www.mathworksheetsgo.com/sheets/trigonometry/advanced/law-of-sines-and-cosines/worksheet.php* *http://mathontheweb.com/Unit_8_-_Law_of_Sines_and_Cosin.html* (with videos)
March – Week 3 and 4	Parametric Equations and Graphs	Functions, Equivalence, Modeling, Patterns	**No CC standards:** Use parameters to explore motion	Functions and graphs form the basis for understanding mathematics and applications.	What are plane curves? What are parametric equations? How is point plotting used to graph a plane	**Terminology:** Parameters Plane Curve Parametric Equation	*Precalculus, Blitzer, 2004* –Section 9.5 Make a face with parametric equations

			Use parameters to graph equations Convert from rectangular form to parametric and visa versa	Parametric equations can be used to obtain graphs of relations and functions. Parametric equations enable us to define some interesting and important curves that would be difficult or impossible to define in the form $y = f(x)$.	curve described by parametric equations? What is the significance of arrows along a plane curve? What does it mean to eliminate the parameter? What useful information can be obtained by eliminating the parameter?	**Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Final	http://laurashears.info/math122/unit4/parametricActivity/ Football activity on Math Drive Graphing Calculator: http://education.ti.com/en/us/activity/detail?id=C6FFB6BD6FB84EACB85C074175C1D211 http://education.ti.com/en/us/activity/detail?id=901A122CD61248F9896886A8265DFE30 Videos: http://www.onlinemathlearning.com/parametric-equations.html http://www.brightstorm.com/math/precalculus/vectors-and-parametric-equations/parametric-equations-and-motion-problem-1/
April	Partial Fractions	Functions, Equivalence, Modeling, Patterns	**No CC standards:** Understand the Partial fraction decomposition	Partial Fraction Decomposition is a process used to reverse the process of adding and	What is partial fraction decomposition of a rational expression?	**Terminology:** Partial Fractions Partial Fraction Decomposition	*Precalculus, Blitzer, 2004* –Section 7.3 Need to explore:

			of unique linear factors, repeated linear factors, prime quadratic factors, etc. Verify answers by adding answers	subtracting ration expressions.	How can you verify your result for the partial fraction decomposition for a given rational expression? What is the difference between finding the partial fraction decomposition with a distinct linear factor and a repeated linear factor? Or a prime quadratic factor and a repeated prime quadratic factor?	**Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Final	*http://www.bing.com/search?q=partial%20fractions%20activity&pc=conduit&ptag=AEA4AA08C575B4DB994F&form=CONTLB&conlogo=CT3210127&ShowAppsUI=1*
May	Limits	Functions, Equivalence, Modeling, Patterns	**No CC standards:** Understand how to find the limit of a function graphically, numerically and algebraically. Determine the role that asymptotes and continuity play in finding a limit of a function.	Functions and graphs form the basis for understanding mathematics and applications. Limits can be used to describe continuity, the derivative, and the integral: the ideas giving the foundation of calculus. The derivative gives the slope of the tangent line to a curve at a point. Limits can be used to describe the behavior of functions for numbers large in absolute value. The derivative can be summed up using one word: slope.	What are the different definitions of limit in the English language and how do they compare to the mathematical definition ("pushing me to the limit")? What is a practical situation in which your interest lies in getting closer and closer to something rather than actually being there? Is it possible to define $f(x) = \frac{1}{x-9}$ at $x = 9$ so that the function becomes continuous at 9?	**Terminology:** Limits Limit Notation Continuous Functions Right and Left Hand Limits One Sided Limts Derivative Difference Quotient Properties of Limits Secant Line Average Rate of Change Instantaneous Rate of Change Instantaneous Velocity **Assessments:**	*Precalculus, Blitzer, 2004* –Chapter 11 Graphing Calculator: http://education.ti.com/en/us/activity/detail?id=5E35908874844345994A1F2E37C98FF4 Activity: http://illuminations.nctm.org/ActivityDetail.aspx?ID=153

					Are there different types of discontinuity? What does it mean if a function has no limit as x approaches a? How do you determine whether a function is continuous at a number? If a function is not defined at a, how is this shown on the function's graph? What are the similarities and differences in the definitions of "continuous" in the English language and the mathematical definition ("pushing me to the limit")? How does the tangent line to the graph of a function at point P related to the secant lines between points P and Q on the function's graph? What do we mean by the slope of the graph of a function at a point? How is the instantaneous rate of change of a function at a point related to its average rate of change?	Participation Homework Quizzes/Tests In-Class Work Projects/Activities Final	

					If a function expresses an object's distance in terms of time, how do you find the instantaneous velocity of the object at any time during its motion? What one word can be used to describe the derivative? What is the difference between rate of change and slope? How can you find the limit using a table? How can you find the limit using a graph?		
NOTE TO TEACHER: Use Critical Thinking, Application and Writing in Mathematics sections of Precalc book to write essential questions and EU. If needed for students to	Linear Systems of Equations	Functions, Equivalence, Solving Equations & Inequalities	**A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation.	To solve a system of equations, find a set of values that replace the variables in the equations and make each equation true. You can solve a system of equations by writing equivalent systems until the value of one variable is clear. Then substitute to find the value(s) of the other variable(s). You can solve a system of inequalities in more than one way. Graphing the solution is usually the most appropriate method.	How does representing functions graphically help you solve a system of equations? How can writing equivalent equations help you solve a system of equations? How are the properties of equality used in the solution of a system of equations? What are the similarities and differences between solving a linear equation compared to a linear inequality?	**Terminology:** **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	*Algebra 2*, *Prentice Hall Mathematics, 2007* Chapter 3 *Precalculus, Blitzer, 2004* –Sections 7.1, 7.2, 7.5 and 7.6

pass Keystone. Do systems of 3 as Common Core catches up to us.				The solution is the set of all points that are solutions of each inequality in the system. Some real-world problems involve multiple linear relationships. Linear programming accounts for all of these linear relationships and gives the solution to the problem. To solve systems of three equations in three variables, you can use some of the same algebraic methods you used to solve systems of two equations in two variables.			
As Common Core catches up to us.	Trigonometric Theory and Equations	Equivalence, Function	**CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures. **CC.2.3.HS.A.8** Apply geometric concepts to model and solve real world problems. **CC.2.3.HS.A.11** Apply coordinate geometry to prove simple geometric theorems algebraically.	Trigonometric identities can be established by using other trigonometric identities via trigonometric proofs. It is possible to establish specific trigonometric identities via trigonometric proofs using the following classifications of trigonometric identities and formulas: Quotient identities, Reciprocal identities, Pythagorean	How are trigonometric identities used to solve a trigonometric problem? Is it possible to simplify a trigonometric statement using trigonometric identities and properties? Is it possible to rewrite trigonometric identities out of fraction form?	**Terminology:** Identities: • Trigonometric • Reciprocal • Sum and difference Angle • Inverse Trig • Reciprocal Pythagorean • Double-Angle • Co-Function • Negative Angle • Half-Angle	*Algebra 2*, *Prentice Hall Mathematics, 2007*, Chapter 14 *Precalculus, Blitzer, 2004* –Chapter 5

			CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.	identities, Even-Odd identities, Sum and Difference formulas, Double-Angle formulas, Half-Angle formulas, Product-to-Sum formulas, and Sum-to-Product formulas. The interrelationships among the six basis trigonometric functions make it possible to write trigonometric expressions in various equivalent forms, some of which can be significantly easier to work with than others in mathematical applications. If you know the measures of enough parts of a triangle, you can completely determine the triangle (find the measure of all sides and angles). To solve some trigonometric equations, you can use an inverse trigonometric function to find one solution, and then use periodicity to find all solutions. If you restrict the domains of the trigonometric functions to angle measures between 0^o and 90^o, the function values	How can a trigonometric identity or property be verified algebraically? How can the double-angle identity for sine be used to calculate a distance? How do you use graphs or trigonometric functions to determine trigonometric identities? How do you graphically solve a trigonometric equation? How is proving or verifying a trigonometric identity different than solving a trigonometric equation?	**Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	

				are the trigonometric rations associated with the acute angles of a right triangle.			
If needed for students to pass Keystone	Probability	Probability	**A1.2.3.1.1** Calculate and/or interpret the range, quartiles, and interquartile range of data. **A1.2.3.2.1** Estimate or calculate to make predictions based on a circle, line, bar graph, measures of central tendency, or other representations. **A1.2.3.2.2** Analyze data, make predictions, and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations). **A1.2.3.3.1** Find probabilities for compound event (e.g., find probability of red and blue, find probability of red or blue) and represent as a fraction, decimal, or percent. **A2.2.3.2.1** Use combinations, permutations, and the	You can use multiplication to quickly count the number of ways certain things can happen. The probability of an impossible event is 0 (or 0%). The probability of a certain event is 1 (or 100%). Otherwise, the probability of an event is a number between 0 and 1 (or a percent between 0% and 100%). To find the probability of two events occurring together, you have to decide whether one event occurring affects the other event. Conditional probability exists when two events are dependent. You can describe and compare sets of data using various statistical measures, depending on what characteristics you want to study.	What is the difference between experimental and theoretical probability? How are measures of central tendency used to describe data?	**Terminology:** Fundamental Counting Principle Permutation Combination Factorial Sample Space Event Theoretical Probability Empirical Probability Complement Mutually Exclusive Event Independent Event Dependent Event Conditional Probability **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	Algebra 2, Prentice Hall Mathematics, 2007 – Chapter 10 And 11 *Precalculus, Blitzer, 2004* –Chapter 10 http://gwydir.demon.co.uk/jo/probability/calcdice.htm

			fundamental counting principle to solve problems involving probability. **A2.2.3.2.3** Use probability for independent, dependent, or compound events to predict outcomes.				
As Common Core catches up to us. This section needs work	Systems of Equations (non-linear)	Functions, Equivalence, Solving Equations & Inequalities	**A1.1.2.2.1** Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. **A1.1.2.2.2** Interpret solutions to problems in the context of the problem situation. **A1.1.3.2.1** Write and/or solve a system of linear inequalities using graphing. **A1.1.3.2.2** Interpret solutions to problems in the context of the problem situation.	To solve a system of equations, find a set of values that replace the variables in the equations and make each equation true. You can solve a system of equations by writing equivalent systems until the value of one variable is clear. Then substitute to find the value(s) of the other variable(s). You can solve a system of inequalities in more than one way. Graphing the solution is usually the most appropriate method. The solution is the set of all points that are solutions of each inequality in the system. Some real-world problems involve multiple linear relationships. Linear programming accounts for all of these linear relationships and	How does representing functions graphically help you solve a system of equations? How can writing equivalent equations help you solve a system of equations? How are the properties of equality used in the solution of a system of equations? What are the similarities and differences between solving a linear equation compared to a linear inequality? How do you solve a nonlinear system graphically?	**Terminology:** **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	*Algebra 2*, *Prentice Hall Mathematics, 2007* Chapter 3 *Precalculus, Blitzer, 2004* –Sections 7.1, 7.2, 7.5 and 7.6 Activity exploring systems that are both linear and nonlinear, using matrices on Graphing calculator.

				gives the solution to the problem. To solve systems of three equations in three variables, you can use some of the same algebraic methods you used to solve systems of two equations in two variables.			
As Common Core catches up to us.	Matrices	Modeling, Equivalence, Functions, Solving Equations	**+ N.VM, 6, 7, 8, 9, 10, 11, 12** From CC Perform operations on matrices and use matrices in applications	You can extend the addition and subtraction of numbers to matrices. The product of two matrices is a matrix. The product of a matrix and its inverse matrix is the multiplicative identity matrix. Not all matrices have inverses. You can solve some matrix equations by multiplying each side of the equation by the inverse of matrix A You can add matrices that have like dimensions (Row x Column). You can only multiply matrices that when the columns of the first equal the rows of the second.	How can you use a matrix to organize data? How can you use a matrix equation to model a real-world situation How can a matrix represent a transformation of a geometric figure in the plane? How can you use matrices to solve a system of equations? What are the similarities/differences between an algebraic system of equations and a matrix? How do you determine whether two matrices can be added, subtracted, multiplied or solved?	**Terminology:** Determinant Dilation Equal matrices Matrix Equation Scalar multiplication Variable matrix Zero matrix Identity matrix **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	Algebra 2, Prentice Hall Mathematics, 2007 – Chapter 12 *Precalculus, Blitzer, 2004* –Chapter 8 Videos: http://www.brightstorm.com/math/algebra/solving-systems-of-equations/solving-systems-of-equations-by-graphing/ http://www.onlinemathlearning.com/matrix-systems-equations.html Tutorial: http://algebralab.org/lessons/lesson.aspx?fil

					Where is an example of where you would use matrices?		e=Algebra_matrix_systems.xml Look for: Solving Systems activity graphically on Paper and Graphing Calculator and Algebraically Solving 2x2 systems using matrices on graphing calculator Activity Exploring secret codes using matrices and inverses of matrices
As Common Core catches up to us.	Number Theory	Arithmetic and Geometric Sequences	**CC.2.1.HS.C.3** Write functions or sequences that model relationships between two quantities. **CC.2.2.HS.D.9** Use reasoning to solve equations and justify the solution method.	It is possible to find any term in an arithmetic or geometric sequence, when given the appropriate information. Compare and contrast the common difference and common ratio. It is possible to find the sum of many arithmetic and geometric sequences.	How are sequences used to model mathematical ideas and real-world situations? What is the difference between arithmetic and geometric sequences? How does sigma notation relate to sequences? How are the terms of sequences generated? What is the connection between linear	**Terminology:** Arithmetic Sequence Common Difference Geometric Sequence Common Ratio **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	Algebra 2, Prentice Hall Mathematics, 2007 – Chapter 9 *Precalculus, Blitzer, 2004* –Chapter 10 On-Line Resources http://www.superteachertools.com/jeopardy/usergames/Jan201204/game1327893923.php Explicit and recursive Formula Activity and

					functions and arithmetic sequences?		Building sequences Activity (scroll down) https://commoncorealgebra1.wikispaces.hcpss.org/Unit+2 Graphing Calculator: http://education.ti.com/en/us/activity/detail?id=519B1FC7C13D4B9EAAE5142030CB1400 http://mathbits.com/MathBits/TISection/Algebra2/sequences.htm
As Common Core catches up to us.	Conic Sections	Modeling, Equivalence, Functions, Solving Equations	**+G.GPE.3** Translate between the geometric description and the equation for a conic section		How is the procedure of parameterization of conic sections used to solve real world problems? How do you determine the shape of a translated conic section with graphing? How does the concept of distance relate of the concepts of ellipses and hyperbolas?	**Terminology:** Arithmetic Sequence Common Difference Geometric Sequence Common Ratio **Assessments:** Participation Homework Quizzes/Tests In-Class Work Projects/Activities Midterm	*Algebra 2*, *Prentice Hall Mathematics, 2007* Section 10.4 *Precalculus, Blitzer, 2004* –Chapter 9 Find: Activity to determine the shape of a translated conic without graphing And Creating your own ellipse on a paper plate and identifying

							the important characteristics of the ellipse. http://www.bing.com/search?q=Creating%20your%20own%20ellipse%20on%20a%20paper%20plate%20and%20identifying%20the%20important%20characteristics%20of%20the%20ellipse&pc=conduit&ptag=AEA4AA08C575B4DB994F&form=CONTLB&conlogo=CT3210127&ShowAppsUI=1
	Polar	Modeling, Equivalence, Functions, Solving Equations	**Check ALg 2 Standards for this**	Polar equations enable us to define some interesting and important curves that would be difficult or impossible it define in the form $y = f(x)$.	What is a test for symmetry with respect to the line $\theta = \frac{\pi}{2}$ in which r is not replaced? If an equation fails the test for symmetry with respect to the polar axis, what can you conclude? What is the procedure for converting a rectangular ordered pair to polar form and visa versa? How do you graph a polar coordinate?	**Terminology:** Polar Coordinate System Pole Polar Axis Polar Equation Limacons Polar Symmetry Rose curve Lemniscate **Assessments:** Participation Homework Quizzes/Tests In-Class Work	*Precalculus, Blitzer, 2004* –Chapter 6.3 *http://www2.southeastern.edu/Grants/LASIP/lessons/mblp.htm* \ Interactive: *http://blog.keycurriculum.com/2013/04/cartesian-and-polar-graphs/* *http://www.intmath.com/plane-analytic-*

					How many points are represented by an ordered pair? How many points are represented by a polar coordinate? How do you convert an Equation from Rectangular to Polar and visa versa? How do you graph a polar equation? How is a complex number converted to polar form?	Projects/Activities Midterm or Final	*geometry/7-polar-coordinates.php* *http://www.shodor.org/interactivate/lessons/PolarCoordinates/* Activity: http://www.teacherlink.org/content/math/activities/em-polar/home.html Graph Mickey Mouse Activity on the Graphing Calculator in Polar Coordinates
Place with Polar	Complex Numbers in Polar Form: DeMoivre's Theorem		**Check ALg 2 Standards for this**		How do you plot a complex number in the complex plane? How do you determine the absolute value of a complex number? What is the polar form of a complex number If you are given a complex number in rectangular form, how do you write it in polar form and visa versa? How do you find the product of two complex	**Terminology:** Real Axis Imaginary Axis Complex Plane Polar Form of a Complex Number Absolute Value of a Complex Number Complex Sixth Root Complex n^{th} Root DeMoivre's Theorem **Assessments:** Participation Homework	*Precalculus, Blitzer, 2004* –Section 6.4 Interactive Converting between complex and polar form: http://www.intmath.com/complex-numbers/4-polar-form.php Tutorial:

					numbers in polar form? How do you find the quotient of two complex numbers in polar form? How do you use DeMoivre's theorem to find complex roots to find the two square roots of 9? How is a complex number converted to polar form?	Quizzes/Tests In-Class Work Projects/Activities Midterm or Final	http://www.mathonweb.com/help_ebook/html/complex_2.htm Polar Multiplication and division Video: http://www.onlinemathlearning.com/multiply-divide-complex-polar.html

***** Some teachers may need to think about the assessments and resources used in order to determine the Big Ideas, Enduring Understandings, and Essential Questions embedded in their courses. At this point in your curriculum mapping, you might want to ignore the "Common Assessments" and "Common Resources Used" columns. However, you may use them if you wish.