

Pine Hill Public Schools Curriculum			
Content Area:		Mathematics	
Course Title/ Grade Level:		Trigonometry Pre-Calculus	
Unit 1:	Algebraic, Exponential, and Logarithmic Functions	Month:	September-November
Unit 2:	Trigonometric and Periodic Functions	Month:	November-January
Unit 3:	Analytic Geometry	Month:	February-April
Unit 4:	Introduction to Discrete and Continuous Mathematics	Month:	April-June
BOE Approval Date:		August 28, 2012	

Pine Hill Public Schools Curriculum	
Unit Title: Algebraic, Exponential, and Logarithmic Functions	Unit #: 1
Course or Grade Level: Trigonometry Pre Calculus	Duration: 10 Weeks
Pacing	September, October, November

Essential Questions	<ul style="list-style-type: none"> •How do algebraic functions model real-world problems and their solutions? •How do exponential functions model real-world problems and their solutions? •How do logarithmic functions model real-world problems and their solutions? •How are expressions involving exponents and logarithms related? •How do you determine the best fit model for a given set of data?
Content	<ul style="list-style-type: none"> • Functions: Graphically, Algebraically, Numerically, and Verbally (1-1) •Types of Functions (1-2) •Dilation and Translation of Function Graphs (1-3) •Composition of Functions (1-4) •Inverse Functions and parametric Equations (1-5) •Reflections, Absolute Values, and Other Transformations (1-6) •Shapes of Function Graphs (2-1) •Identifying Functions from Graphical Patterns (2-2) •Identifying Functions from Numerical Patterns (2-3) •Properties of Logarithms (2-4) •Logarithms: Equations and Other Bases (2-5) •Logarithmic Functions (2-6) •Introduction to Regression for Linear Data (3-1) •Deviations, Residuals, and the Correlation Coefficient (3-2) •Regression for Nonlinear Data (3-3) •Linearizing Data and Logarithmic Graph Paper (3-4) •Residual Plots and Mathematical Models (3-5) •Introduction to Polynomial and Rational Functions (4-1) •Quadratic Functions, Factoring, and Complex Numbers (4-2) •Graphs and Zeroes of Higher-Degree Functions (4-3) •Fitting Polynomial Functions to Data (4-4) •Rational Functions: Asymptotes and Discontinuities (4-5) •Partial Fractions and Operations with Rational Expressions (4-6) •Fractional Equations and Extraneous Solutions (4-7)
Skills	<ul style="list-style-type: none"> • Defining functions Graphically, Algebraically, Numerically, or Verbally (1-1) • Create connections among the Algebraic Equation for a Function (1-2) • Transform the Pre-Image of a Function by Dilations and Translations (1-3) • Graph and Evaluate the Composition of Functions (1-4) • Determine the Inverse Relation of a Function and Graph using Parametric Equations (1-5) • Transform Functions by Reflection and Absolute Value (1-6) • Discover patterns in the graphs of Linear, Quadratic, Power, and Exponential Functions (2-1) • Determine the Parent Function given its Graph (2-2) • Determine the Parent Function given a data set and corresponding values through patterns (2-3) • Absorb the properties of Base-10 Logarithms (2-4) • Use Logarithms with Base-10 or other bases to solve Exponential or Logarithmic Equations (2-5) • Demonstrate that Logarithmic Functions have the Multiply-Add Property, and find equations Algebraically (2-6) • Determine the equation of a Linear Function given a set of points and calculate the SS_{res} (3-1) • Calculate the SS_{res} and determine the Linear Function that minimizes the SS_{res} (3-2) • Create Scatter Plots and determine the appropriate Regression given a data set (3-3) • Transform and Plot data using Logarithms (3-4) • Determine the Parent Function by Graphing and Analyzing the Residuals (3-5) • Discover properties of Polynomial and Rational Functions (4-1) • Review Quadratic Functions by their Properties and Graphs (4-2) • Determine the Degree and Zeros of a Polynomial Function given the Graph or Equation (4-3) • Determine the equation of a Polynomial Function that best fits by Analyzing the data set (4-4) • Discover properties of Polynomial and Rational Functions given their Graph (4-5) • Perform operations on Rational Expressions and resolve proper Algebraic Fractions into the sum of two or more Partial Fractions (4-6) • Given a Rational Algebraic Function f, find x for a given value of $f(x)$ (4-7)

Assessments	Formative: <ul style="list-style-type: none"> • Teacher observation and questioning • Seat and or group work • Fist to five/ Thumbs up, thumbs down • Homework • Student participation at board Summative <ul style="list-style-type: none"> • Quizzes, tests, and benchmarks
Interventions/ differentiated Instruction	<ul style="list-style-type: none"> • Students given handouts of power point notes • Students given access to online textbook • Partners or group work (groups formed heterogeneously according to ability)
Inter- disciplinary Connections	<ul style="list-style-type: none"> • Using finance to calculate a mortgage payment by an exponential equation • Using astrology to determine the spiral arms of the galaxy and how it follows a logarithmic pattern • Using geometry to determine the volume of a cylinder modeled by a polynomial function
Lesson resources / Activities	<ul style="list-style-type: none"> • Precalculus with Trigonometry Concepts and Applications, copyright 2012 – Chapters 1-4 • Power point resources • Textbook practice worksheet

Common Core State Standards

Grade or Conceptual Category (HS only): Trigonometry/Pre-Calc

Domain (name and #): Building Functions, Reasoning with Equations and Inequalities, Interpreting Functions

Cluster: Analyze functions using different representations. Analyze regression equations and their behavior. Understand polynomial and rational functions and their behavior.	#. Standard:
	HSF-BF.B.5, HSA-REI.A.2, HSA-REI.D.11, HSS-ID.B.6B, HSF-IF.A.3, HSF-IF.C.7D, HSF-IF.C.7E

21st Century Themes

Global Awareness	Financial, Economic, Business, and Entrepreneurial Literacy	Civic Literacy	Health Literacy
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21st Century Skills

Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration	Information Literacy
Media Literacy		ICT Literacy	X	Life and Career Skills	

**Pine Hill Public Schools
Curriculum**

Unit Title: Trigonometric and Periodic Functions	Unit #: 2
Course or Grade Level: Trigonometry Pre-Calculus	Duration: 13 weeks

Pacing	November, December, January
Essential Questions	<ul style="list-style-type: none"> •How can you model periodic behavior? •What are periodic functions? •What information does a trigonometric function provide of its graph, and vice versa? •If you know the value of $\sin \theta$, how can you find the $\cos \theta$, $\tan \theta$, $\csc \theta$, $\sec \theta$, and $\cot \theta$? •How are translated sine and cosine graphs created on graph paper? •How is the domain and range of the six Trigonometric functions determined? •How do amplitudes, periods, phase shifts, vertical shifts and cofunctions relate to the graphs of translated sine and cosine functions? •What are the basic properties of tangent, cotangent, cosecant and secant graphs? •Which trigonometric functions have asymptotes and why?
Content	<ul style="list-style-type: none"> • Introduction to Periodic Functions (5-1) • Measurement of Rotation (5-2) • Sine and Cosine Functions (5-3) • Values of the Six Trigonometric Functions (5-4) • Inverse Trigonometric Functions and Triangle Problems (5-5) • Sinusoids: Amplitude, Period, and Cycles (6-1) • General Sinusoidal Graphs (6-2) • Graphs of Tangent, Cotangent, Secant, and Cosecant Functions (6-3) • Radian Measure of Angles (6-4) • Circular Functions (6-5) • Sinusoidal Functions as Mathematical Models (6-7) • Rotary Motion (6-8) • Introduction to the Pythagorean Property (7-1) • Pythagorean, Reciprocal, and Quotient Properties (7-2) • Identities and Algebraic Transformation of Expression (7-3) • Arcsine, Arctangent, Arccosine, and Trigonometric Equations (7-4) • Inverse Trigonometric Relation Graphs (7-6) • Other Composite Argument Properties (8-3) • The Sum and Product Properties (8-5) • Double and Half Argument Properties (8-6) • Introduction to Oblique Triangles (9-1) • Oblique Triangles: The Law of Cosines (9-2) • Area of a Triangle (9-3) • Oblique Triangles: The Law of Sines (9-4) • The Ambiguous Case (9-5) • Real World Triangle Problems (9-7)
Skills	<ul style="list-style-type: none"> • Find and Graph the Function that corresponds to the Graph of a Sinusoid (5-1) • Given an Angle of any measure, draw a picture of that Angle (5-2) • Extend the definitions of the Sine and Cosine to any Angle (5-3) • Find values of the Six Trigonometric Functions approximately for any Angle and exactly for certain Special Angles (5-4) • Determine the measures of Sides and Angles of a Right Triangle given certain measurements (5-5) • Acquire the meanings of the vocabulary associated with a Sinusoidal Graph (6-1) • Determine all aspects and properties of a Sinusoid (6-2) • Graph Inverse Trigonometric Functions and show behaviors when the function value is undefined (6-3) • Convert Angle measures from using Degrees and Radians and find Trigonometric Function values (6-4) • Learn about the Circular Functions and their relationships to Trigonometric Functions (6-5) • Find specific values of x or θ Graphically, Numerically, and Algebraically given the equation of a Circular or Trigonometric Function (6-6) • Write an equation using the Sine or Cosine Function and create predictions and interpretations of the real world (6-7) • Find Linear or Angular Velocities of points on Rotating Objects (6-8) • Investigate the sum of the squares of Cosine and Sine of the same argument (7-1)

	<ul style="list-style-type: none"> • Derive Algebraically three kinds of properties expressing relationships among Trigonometric Functions (7-2) • Transform Trigonometric expressions into equivalent expressions (7-3) • Find the solutions to equations Algebraically or Numerically involving Circular or Trigonometric Functions of one argument (7-4) • Plot the graph of Parametric Functions and make conclusions about the Geometric Figure (7-5) • Plot and find exact values of Inverse Trigonometric Functions (7-6) • Derive and absorb Odd-Even Properties and Cofunction Properties of Trigonometric Functions (8-3) • Define the Sum and Product Properties of Sine and Cosine (8-5) • Express equations as Double and Half Argument Properties of Sine and Cosine (8-6) • Determine the length of the third side of a Triangle through Direct Measurement (9-1) • Derive and use the Law of Cosines to find Angle and Side measures of a Triangle (9-2) • Find the Area of a Triangle through Sine and Hero's Formula (9-3) • Derive and use the Law of Sines to find Angle and Side measures of a Triangle (9-4) • Determine possible measures of Triangles give Ambiguous Cases (9-5) • Determine the measures of Real –World Triangles by the use of the Laws of Sines and Cosines (9-7)
Assessments	<p>Formative:</p> <ul style="list-style-type: none"> • Teacher observation and questioning • Seat and or group work • Fist to five/ Thumbs up, thumbs down • Homework • Student participation at board <p>Summative</p> <ul style="list-style-type: none"> • Quizzes, tests, and benchmarks
Interventions/ differentiated Instruction	<ul style="list-style-type: none"> • Students given handouts of power point notes • Students given access to online textbook • Partners or group work (groups formed heterogeneously according to ability)
Inter- disciplinary Connections	<ul style="list-style-type: none"> • Using science to approximate the diameter of a planet by measuring the angle between the lines of sight to the two sides of the planet • Using astronomy to calculate the number of sunspots that occur on the surface of the Sun through sinusoidal functions • Using geometry to derive the law of sines and cosines
Lesson resources / Activities	<ul style="list-style-type: none"> • Precalculus with Trigonometry Concepts and Applications, copyright 2012 – Chapters 5-9 • Power point resources • Textbook practice worksheet
Common Core State Standards	
Grade or Conceptual Category (HS only): Trigonometry/Pre-Calc	
Domain (name and #): Interpreting Functions, Trigonometric Functions, Similarity, Right Triangle, and Trigonometry	
Cluster: Model periodic phenomena with trigonometric functions. Extend the domain of trigonometric functions using the unit circle. Analyze functions using different representations. Apply trigonometry to	#. Standard:
	HSF-IF.C.7E, HSF-TF.A1, HSF-TF.A2, HSF-TF.A3, HSF-TF.A4, HSF-TF.B5, HSF-TF.B6, HSF-TF.B7, HSF-F.C9, HSF-TF.C10, G-SRT-6, G-SRT -7, G-SRT-8G, SRT-10, G-SRT-11,

**general triangles.
Define trigonometric ratios, and solve problems involving right triangles.**

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

**Pine Hill Public Schools
Curriculum**

Unit Title: Analytic Geometry		Unit #: 3
Course or Grade Level: Trigonometry Pre-Calculus		Duration: 7 weeks
Pacing	March, April	
Essential Questions	<ul style="list-style-type: none"> •What is analytical geometry? •How can technology be used to enhance the understanding of conics? •How are the shapes, known as conic sections, created? 	

	<ul style="list-style-type: none"> •How are equations of conic sections analyzed and graphed? •What are the similarities and differences in the equations of conic sections and the key features of their graphs? •How can the general form of a conic section equation be converted to standard form? •What real-world issues could be analyzed and solved using equations and graphs of conic sections?
Content	<ul style="list-style-type: none"> • Quadratic Relations and Conic Sections (10-1) • Cartesian Equations for Conic Sections (10-2) • Parametric Equations for Conic Sections (10-3) • Quadric Surfaces and Inscribed Figures (10-4) • Analytic Geometry of the Conic Sections (10-5) • Application of Conic Sections (10-6) • Introduction to Polar Coordinates (11-1) • Polar Equations for Conics and Other Curves (11-2) • Intersections of Polar Curves (11-3) • Complex Numbers in Polar Form (11-4)
Skills	<ul style="list-style-type: none"> •Graph and formulate conclusions about a Quadratic Equation with two variables •Write and transform Cartesian Equations that are created from Conic Sections •Transforming Parametric Equations into Cartesian Equations by plotting their graph •Determine the Area or Volume of a figure inscribed into a Conic Section •Find the Foci, the Directrix, and the Eccentricity of a Conic Section •Identify and plot rotated conic sections from its Cartesian Equation •Plot Polar Coordinates on a Coordinate Plane •Transform Polar Coordinates into Cartesian Coordinates •Find the solutions of the System of Equations given two Polar Equations •Operate with Complex Numbers in Polar Form
Assessments	<p>Formative:</p> <ul style="list-style-type: none"> • Teacher observation and questioning • Seat and or group work • Fist to five/ Thumbs up, thumbs down • Homework • Student participation at board <p>Summative</p> <ul style="list-style-type: none"> • Quizzes, tests, and benchmarks
Interventions/ differentiated Instruction	<ul style="list-style-type: none"> • Students given handouts of power point notes • Students given access to online textbook • Partners or group work (groups formed heterogeneously according to ability)
Inter- disciplinary Connections	<ul style="list-style-type: none"> • Using science to determine the elliptical path close to the Sun that a spaceship orbits • Using physics to determine the projectile motion from firing a cannonball from a ship through a parametric equation
Lesson resources / Activities	<ul style="list-style-type: none"> • Precalculus with Trigonometry Concepts and Applications, copyright 2012 – Chapters 10-11 • Power point resources • Textbook practice worksheet
Common Core State Standards	
Grade or Conceptual Category (HS only): Trigonometry/Pre-Calc	
Domain (name and #): Congruence, Expressing Geometric Properties with Equations, Complex Number System	

Cluster: Analyze the characteristics and properties of conic figures and conic sections. Understand polar coordinates and polar equations. Understand the complex number system and how it is applied to conics.	#. Standard:
	HSG-CO.A4, HSG-CO.A5, HSG-GPE.A1, HSG-GPE.A2, HSG-GPE.A3, HSN-CN.B4

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

Pine Hill Public Schools Curriculum	
Unit Title: Introduction to Discrete and Continuous Mathematics	Unit #: 4
Course or Grade Level: Trigonometry Pre-Calculus	Duration: 10 weeks
Date Created: 8/04/2014	BOE Approval Date:
Pacing	•April to June

Essential Questions	<ul style="list-style-type: none"> •How do you distinguish between discrete and continuous random variables? •How do you identify the sample space of a probability experiment? •How do you find the probability of an event given that another event has occurred? •How do you use counting principles to find probabilities? •How are sequences and series used to model many mathematical ideas and realistic situations? •How does the concept of a limit lead to a derivative? •How are integrals used to measure changing quantities?
Content	<ul style="list-style-type: none"> • Introduction to Probability (14.1) • Words Associated with Probability (14.2) • Two Counting Principles (14.3) • Probabilities of Various Permutations (14.4) • Probabilities of Various Combinations (14.5) • Properties of Probability (14.6) • Functions of a Random Variable (14.7) • Mathematical Expectation (14.8) • Introduction to Sequences and Series (15.1) • Arithmetic, Geometric, and Other Sequences (15.2) • Series and Partial Sums (15.3) • Exploring Limits, Derivatives, and Integrals (16.1) • Limits (16.2) • Rate of Change of a Function: The Derivative (16.3) • Accumulated Rates: The Definite Integral (16.4)
Skills	<ul style="list-style-type: none"> •Find the Probability of various events in a dice-rolling experiment •Distinguish among various words used to describe Probability •Calculate the number of outcomes in an Event or Sample Space •Determine the Probability of a Permutation from an arrangement chosen at random •Calculate the different Combinations containing r elements taken from a set containing n elements •Determine the Intersection, Union, and Complement of two events •Find and Graph the Probabilities of all possible events •Calculate the Mathematical Expectation for a given random experiment •Determine the sum of a specified number of terms in a Sequence •Represent Sequences Explicitly and Recursively •Determine the Partial Sum of a given Sequence and use Sigma Notation to write the Partial Sum •Approximate the Instantaneous Rate of Change and approximate the Distance traveled during a specific Time Interval •Use Limits to determine the values that are approximate to a point of Discontinuity •Use Limits to determine the Derivative or Instantaneous Rate of Change •Find the Distance traveled over a specific Time of a moving object
Assessments	<p>Formative:</p> <ul style="list-style-type: none"> • Teacher observation and questioning • Seat and or group work • Fist to five/ Thumbs up, thumbs down • Homework • Student participation at board <p>Summative</p> <ul style="list-style-type: none"> • Quizzes, tests, and benchmarks
Interventions/ differentiated Instruction	<ul style="list-style-type: none"> • Students given handouts of power point notes • Students given access to online textbook • Partners or group work (groups formed heterogeneously according to ability)

Inter-disciplinary Connections	<ul style="list-style-type: none"> Using science to determine the probability of producing same haired offspring through heredity Using finance to determine the depreciation of a business's income by the use of sequences Using astronomy to determine the distances between planets by the use of an arithmetic sequence
Lesson resources / Activities	<ul style="list-style-type: none"> Precalculus with Trigonometry Concepts and Applications, copyright 2012 – Chapters 14-16 Power point resources Textbook practice worksheet

Common Core State Standards

Grade or Conceptual Category (HS only): Trigonometry/Pre-Calc

Domain (name and #):

Cluster: Apply the probability properties to solve various problems. Understand the concepts of limits and how they are used in solving higher level problems. Analyze sequences and sums.

#. Standard: Conditional Probability and the Rules of Probability, Using Probability to Make Decisions, Interpreting Functions, Linear, Quadratic, and Exponential Models

HSS-CP.A1, HSS-CP.A2, HSS-CP.A3, HSS-MD.A1, HSS-MD.A2, HSS-MD.A3, HSS-MD.A4, HSS-MD.B, HSS-CP.B9, HSF-IF.A3, HSF-IF.B6, HSF-LE.A2

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

Revised: August 26, 2014