Course Title:Honors PrecalculusBoard Approval Date:Credit / Hours:1 CreditReviewed Annually

### **Course Description:**

This course provides students with a comprehensive study of the definitions, concepts, applications, and graphs of trigonometric, polynomial, rational, exponential, and logarithmic functions. The course is taught at an accelerated pace so that additional mathematical topics can be studied. These additional concepts include: sequences & series, factorials, and conic sections. \*Students will need a TI-89 graphing calculator for this course.

#### Learning Activities / Modes of Assessment:

Large group instruction Experiments Small group/team work Journals/Learning Logs Tests and Quizzes Teacher Observation Projects with Rubrics

#### **Instructional Resources:**

Precalculus with Limits/A Graphing Approach: Brooks/Cole CENGAGE Learning (2012,2008)

Course: Honors Precalculus			
	rse Unit (Topic) ys/Periods)	Length of Instruction	
1.	Review of Linear Functions.	20 days	
2.	Polynomial Functions of Higher Degree	25 days	
3.	Rational Functions	15 days	
4.	Exponential and Logarithmic Functions.	30 days	
5.	Trigonometric Functions and their graphs	45 days	
6.	Analytic Trigonometry	15 days	
7.	Trigonometric Applications	10 days	
8.	Conic Sections	<u>20 days</u>	
Tota	al Days	180 days	

Curriculum: CCSD CURRICULUM Course: Honors Precalculus

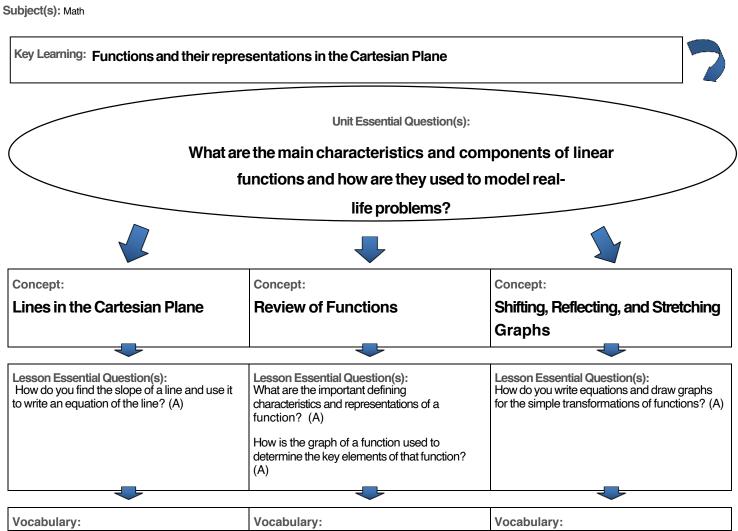
Topic: 1 Review of Linear Functions Subject(s): Math Date: 6/2022

Days: 20 Grade(s): 10th ,

Know:	Understand:	Do:
Review of identifying types of lines and linear functions Review of characteristics of functions Review of composition and inverse functions		<ul> <li>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</li> <li>CC.2.2. HS.D.9 Use reasoning to solve equations and justify the solution method.</li> <li>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/ inequalities algebraically and graphically.</li> <li>CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.</li> <li>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.</li> <li>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.</li> <li>CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.</li> <li>CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.</li> <li>CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.</li> </ul>

#### Topic: 1 Review of Linear Functions

**Days:** 20



Concept:	Concept:	Concept:
<b>Combinations of Functions</b>	Inverse Functions	Linear Models and Scatterplots
Lesson Essential Question(s): How do you combine two functions to form a new function? (A)	Lesson Essential Question(s): What is the inverse of a function and how do you represent it graphically and algebraically? (A)	Lesson Essential Question(s): How do you write equations to model real- world data? (A)
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Vocabulary:	Vocabulary:	Vocabulary:

Topic: 2 Polynomial Functions of higher degree Subject(s): Math

Date: 6/2022

Days: 25 Grade(s): 10th

Know:	Understand:	_Do:
Use transformations to sketch polynomials graphs of polynomial functions Find and use zeros of polynomial functions as sketching aids. Analyze graphs of quadratic functions Write quadratic functions in standard form Find the minimum and maximum values of quadratic functions in real-life applications	How to graph polynomial Functions How to find the zeros of a polynomial equations	<ul> <li>CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials</li> <li>CC.2.2.HS.D. 4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.</li> <li>CC.2.2.HS.D.5 Use polynomial identities to solve problems.</li> <li>CC.2.2.HS.D.9 Use reasoning to solve equations or formulas for a given variable.</li> <li>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.</li> <li>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</li> <li>CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.</li> <li>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.</li> <li>CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.</li> <li>CC. 2.2.HS.C.6 Interpret functions in terms of the situations they model.</li> </ul>

### Course: Honors Precalculus

2021-2022

opic: 2 Polynomial Functions of higher degree Subject(s): Math	Days: 25
Key Learning: Analyzing and Graphing polynomial functio	ns 7
\	olynomial functions used to represent pplications?
Concept:	Concept:
Graphing polynomial functions of higher degree	Applications of polynomial functions
Lesson Essential Question(s): How do we sketch polynomial functions? (A)	Lesson Essential Question(s): How are polynomial functions used to model real life applications? (A)
How do we find the REAL zeros of a nonfactorable polynomial function? (A)	
How do we write the equations of a polynomial function from characteristics and/or a sketch of the function ? (A)	
Vocabulary:	Vocabulary:
zeros, fundamental theorem of algebra, rational root theorem	

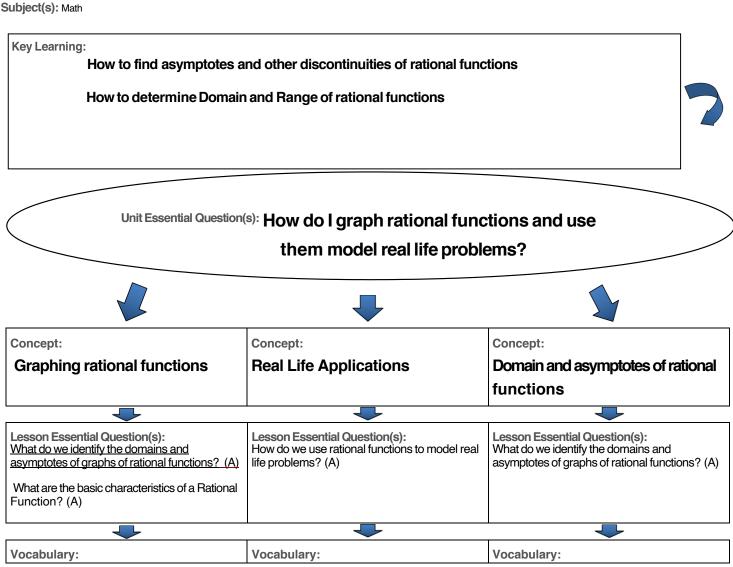
Topic: 3 Rational Functions Subject(s): Math Date: 6/2022

#### Days: 15 Grade(s): 10th

Know:	Understand:	Do:
Graph Rational Functions Finding the domain, discontinuities, and asymptotes Use rational functions to model and solve real life problems	How to find asymptotes and other discontinuities of rational graphs How to determine Domain and Range of rational functions	<ul> <li>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</li> <li>CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.</li> <li>CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.</li> <li>CC.2.2.HS.D.5 Use polynomial identities to solve problems.</li> <li>CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.</li> <li>CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.</li> <li>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.</li> <li>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.</li> <li>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to take connections between the different representations.</li> <li>CC.2.2.HS.C.4 Interpret the effects transformations hoe on functions and find the inverses of functions.</li> <li>CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.</li> </ul>

## Topic: 3 Rational Functions

Days: 15



Topic: 4 Exponential & Logarithmic Functions Subject(s): Math

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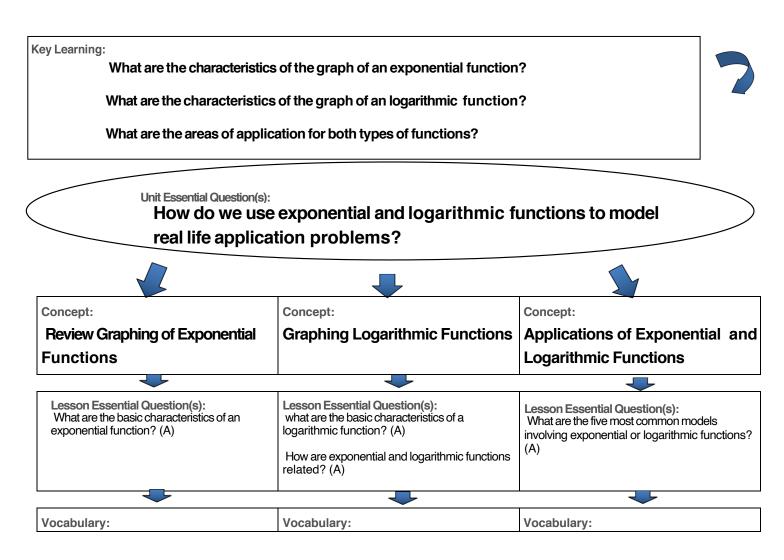
Date: 6/2022

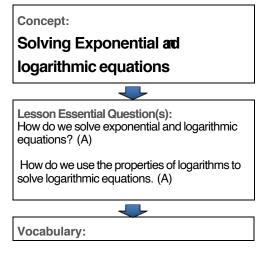
#### Days: 30 Grade(s): 10th

Know:	Understand:	Do:
Graphs of exponential functions	To graph an exponential function	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
Properties of exponentials	To interpret the key characteristics of the	CC.2.2 .HS.D.8 Apply inverse operations to solve equations or formulas for a given variable
Asymptote	graphs of exponential functions	CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
Inverses Properties of Logarithms	To use the properties of exponents to solve exponential equations	CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/ inequalities algebraically and graphically.
Logarithmic equations Definition of a logarithm	To use the properties of logarithms to solve exponential and	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the
Graphing Logarithmic Functions	logarithmic equations To evaluate logarithms	different representations. CC.2.2.HS.C.3 Write functions or sequences that
Applications of Exponential and	To solve applications of	model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations
Logarithmic Functions	exponential and logarithmic functions	have on functions and find the inverses of functions.
		CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
		CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

**Topic:** 4 Exponential & Logarithmic Functions Subject(s): Math

Days: 15





Course: Honors Precalculus

# Topic: 5 Trigonometric Functions and their graphs

Subject(s): Math

Date: 6/2022

Days: 45 Grade(s): 10th

Know:	Understand:	Do:
Definitions of the 6 trigonometric functions Graph of the 6 trigonometric functions Radian measure	Measuring angles in degrees and radians. Interpreting the graphs of the 6 trigonometric functions Evaluating the six	Do: CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
Inverse trigonometric functions	Evaluating the six trigonometric functions	model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of
	Evaluating inverse trigonometric	functions.
	functions	CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
		CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Curriculum: CCSD HS PA

Topic: Unit 5 Trigonometric functions and their graphs.

Unit Essential Question:

# What are the properties of trigonometric functions and their graphs?

<u>Concept:</u>		<u>Concept:</u>	<u>Concept:</u>	
Radians, Degrees and the Unit	How do we evaluate the six		Graphing Trigonometric Fun	ctions
Circle		trigonometric functions?	and their inverses.	
-		-	-	
Lesson Essential Question/s:	<u>Le</u>	esson Essential Question/s:	Lesson Essential Question	<u>n/s:</u>
How do you describe angles	How	do we find the exact values of	f How do you sketch the grap	ohs of
and angular movement? (A)		x trigonometric functions give	-	ons?
How do you use the arc length	a po	int on the terminal side of the	e (A)	
formula to find angular velocity		angle? (A)	What are the characteristics	of the
and linear velocity? (A)	How c	lo we find the six trigonomet	ic inverse trigonometric function	on and
	functions given the measure of an		their graphs? (A)	
	a	ngle in degrees or radians?	How do we identify the	2
			characteristics of a trigonon	
			function including the dom	nain,
			range and asymptotes? (	A)
			How do we evaluate inve	rse
			trigonometric expressions	
Vocabularu		Vocabularu:	Vocabulary	
<u>Vocabulary:</u> Radians, Angular		<u>Vocabulary:</u> Sine, Cosine, Tangent,	<u>Vocabulary:</u> Inverse, Domain, Range,	
Velocity, Linear Ve	locity,	Secant, Cosecant,	Vertical Line Test,	
Arc Length, Cotern	• •	Cotangent.	Horizontal Line Test.	
Initial ray, Termina	l ray			

### PENNSYLVANIA

Date: 6/2022

Days: 15 Grade(s): 10th

#### Topic: 6 Analytic Trigonometry

Subject(s): Math

Know:	Understand:	Do:
Fundamental Trigonometric Identities Verification of Identities Sum and Difference Formulas	Solving trigonometric equations using identities Proving and Verifying trigonometric identities Using Sum and Difference Formulas	<ul> <li>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.</li> <li>CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.</li> <li>CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.</li> <li>CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.</li> <li>CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.</li> </ul>

Curriculum: CCSD HS PA

2021-2022

Topic: Unit 6 Analytic Trigonometry

Unit Essential Question:

#### How do we use the trigonometric identities to solve equations and prove or verify trigonometric identities?

<u>Concept:</u>	<u>Concept:</u>
Solving Trigonometric equations	Verifying and proving trigonometric identities
Lesson Essential Question/s:	Lesson Essential Question/s:
<ul> <li>How do you solve trigonometric equations written in quadratic form or containing more than one angle? (A)</li> <li>How do you simplify expressions and solve equations that contain sums or differences of angles? (A)</li> <li>How do you rewrite trigonometric expressions that contain functions of multiple or half angles or functions that involve squares or products of trigonometric expressions? (A)</li> </ul>	How do we verify the basic trigonometric identities? (A) How do we use the fundamental identities to prove other trigonometric identities? (A)

Vocabulary:	Vocabulary:
	Sine, Cosine, Tangent, Secant, Cosecant,
hippopotomonstrosesquippedaliophobia	Cotangent.

#### Topic: 7 Trigonometric Applications Subject(s): Math

#### Days: 10 Grade(s): 10<sup>th</sup>

Know:	Understand:	Do:
Arclength and Area of a sector Law of Sines	To solve triangles To find the area of	CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
Law of Cosines	triangles	CC.2.2.HS.C.2 Graph and analyze functions and use
Heron's Formula Area of Triangles	Solve trigonometric equations using identities	their properties to make connections between the different representations.
Real life applications	Applications and Modeling	CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
		CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
		CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs
		CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.

Curriculum: CCSD HS PA

2021-2022

Topic: Unit 7 Trigonometric applications

Unit Essential Question:

How do we use the trigonometric functions to solve real life application problems?

<u>Concept:</u>	<u>Concept:</u>
Applications of Trigonometric Functions	Fitting Trigonometric Models to data using a graphing utility.
-	-
Lesson Essential Question/s:	Lesson Essential Question/s:
What are the real life problems involving right triangles? (A)	How do we use a regression curve to fit a data set using a Sine Regression on a graphing utility? (A)
How do I solve problems involving harmonic motions? (A)	
How do we use trigonometry to solve problems involving directional bearings? (A)	
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Vocabulary: Angle of elevation, angle of depression. Nautical miles.	Vocabulary: Regression

Curriculum: CCSD CURRICULUM Course: Honors Precalculus

Topic: 8 Analytic Geometry-Conic Sections

Subject(s): Math

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Date: 6/2022

Days: 20 Grade(s): 10th

Know:	Understand:	Do:
The equations of Circles and Parabolas Ellipses Hyperbolas and Rotations of Conic Sections	Recognizing Conic Sections Solving Problems involving parabolas Solving Problems involving ellipses Solving Problems involving hyperbolas Classifying a conic section from its general equation	<ul> <li>CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.</li> <li>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.</li> <li>CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.</li> <li>CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.</li> <li>CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.</li> </ul>

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Curriculum: CCSD HS PA

2021-2022

Topic: Unit 8 Conic Sections

Unit Essential Question:

What are the graphs created by the intersection of a plane and a cone or pair of cones?

<u>Concept:</u>	<u>Concept:</u>	
Equations of Conic Sections	Graphs of Conic Sections	
Lesson Essential Question/s: How do we determine the equation of conic section? (A) What is the importance of the foci and how do we find them? (A)	Lesson Essential Question/s: How do we graph conic sections? (A) How do we determine the type of graph we should expect based on the equation of the function? (A) How do we write the equation of the function based on the graph? (A)	
Vocabulary:	<u>Vocabulary:</u>	
Circle, Ellipse, Hyperbola, Parabola	Foci, focus, major axis, minor axis.	