PRE-CALCULUS SYLLABUS

2013-2014 Academic School-Year

1st Marking Period – Unit 1

Review of Algebra 2 Concepts – 1 Week (Quiz)

Chapter P - Pre-requisites (Quiz)

P-5 Interval Notation

Chapter 1: Functions and Their Graphs (Test 1.1 – 1.3 and Test 1.4 – 1.5)

1.1 Functions

1.2 Graphs of Functions

1.3 Shifting, Reflecting, and Stretching Graphs

1.4 Combinations of Functions

1.5 Inverse Functions

Chapter 2: Polynomial and Rational Functions (Test 2.1 – 2.3)

2.1 Quadratic Functions

2.2 Polynomial Functions of Higher Degree

2.3 Real Zeros of Polynomial Functions

2nd Marking Period – Unit 2

Chapter 2: Polynomial and Rational Functions (Test 2.4 – 2.5)

2.4 Complex Numbers

2.5 The Fundamental Theorem of Algebra

Chapter 2: Polynomial and Rational Functions (Test 2.6 – 2.7)

2.6 Rational Functions and Asymptotes

2.7 Graphs of Rational Functions

Chapter 3: Exponential and Logarithmic Functions (Test 3.1 – 3.4)

3.1 Exponential Functions and Their Graphs

3.2 Logarithmic Functions and Their Graphs

3.3 Properties of Logarithms

3.4 Solving Exponential and Logarithmic Equations

Chapter 4: Trigonometric Function (Test 4.1 – 4.4)

4.1 Radian and Degree Measure

4.2 Trigonometric Functions: The Unit Circle

4.3 Right Triangle Trigonometry

4.4 Trigonometric Functions of Any Angle

3rd Marking Period – Unit 3

Chapter 4: Trigonometric Function (Test 4.5 – 4.6)

4.5 Graphs of Sine and Cosine Functions

4.6 Graphs of Other Trigonometric Functions

Chapter 4: Trigonometric Function (Test 4.7 – 4.8)

4.7 Inverse Trigonometric Functions

4.8 Applications and Models

Chapter 5: Analytic Trigonometry (Test 5.1 – 5.3)

5.1 Using Fundamental Identities

5.2 Verifying Trigonometric Identities

5.3 Solving Trigonometric Equations

4th Marking Period – Units 4 and 5

Chapter 5: Analytic Trigonometry (Test 5.4 – 5.5)

5.4 Sum and Difference Formulas

5.5 Multiple Angle and Product Sum Formulas

Chapter 6: Additional Topics and Trigonometry (Test 6.1 – 6.2 and 6.3 – 6.4)

6.1 Law of Sines

6.2 Law of Cosines

6.3 Vectors in the Plane

6.4 Vectors and Dot Products

Chapter 7: Systems of Equations and Inequalities (Quiz)

7.3 Multivariable Linear Systems (Just Partial Fractions)

Chapter 10: Topics in Analytic Geometry (Test 10.6 – 10.7)

10.6 Polar Coordinates

10.7 Graphs of Polar Equations

Additional Topics as Time Permits

Chapter 12: Limits and Introduction to Calculus

12.1 Introduction to Limits

12.2 Techniques for Evaluating Limits

Course Expectations and Skills

- Students are required to have proficiency in all prerequisite topics for Algebra 1. Those who do not demonstrate proficiency will be required to seek additional help after school to close their achievement gap in order to be successful in this course.
- Students are required to take notes in Cornell Notes format and maintain those notes in a neat and organized notebook.
- Students are required to have a scientific calculator.
- Students are required to participate in both small and large group discussions and activities, as directed.
- Students are required to complete a project each marking period, including those which require the use of technology.

Resources

Text Book: *Precalculus with Limits, A Graphing Approach,* **Larson**

Additional Resources: Kuta Software and Boardworks (CCSS PowerPoints)

Marking Period Grade Distribution by Category

	1st	4th
MAJ	40%	20%
BMK	20%	20%
MIN	20%	20%
EOC	N/A	20%
CP	10%	10%
HW	10%	10%

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 1 Functions and Their Graphs **Grade Level(s):** **11/12**	**Unit Summary**: In this unit, students will learn about functions and their graphs. Students will be introduced to functions, learn to evaluate functions and find the domain and range of functions both algebraically and graphically. Students will learn how to analyze the graphs of functions. They will identify and graph shifts, reflections and non-rigid transformations of functions. Students will learn to find both arithmetic combinations of functions and the composition of functions. Finally, students will find the inverses of functions graphically and algebraically, and determine if the inverse is also a function.
Essential Question(s): • How can students more easily represent, analyze, and quantify the relationship between functions and their graphs? • How can students use technology to identify important characteristics of functions?	**Enduring Understanding(s):** Students will be able to: • Decide whether relations between two variables are functions • Use function notation and evaluate functions • Find the domains of functions • Use functions to model and solve real-life problems • Find the domains and ranges of functions • Use the Vertical Line Test for functions • Determine intervals on which functions are increasing or decreasing • Determine relative maximum and relative minimum values of functions • Identify and graph step functions and other piecewise-defined functions • Identify even and odd functions • Recognize graphs of common functions • Use vertical and horizontals shifts and reflections to sketch graphs of functions • Use non-rigid transformations to sketch graphs of functions • Add, subtract, multiply, and divide functions • Find the compositions of one function with another function • Use combinations of functions to model and solve real-life problems • Find inverse functions informally and verify that two functions are inverses of each other • Use graphs of functions to decide whether functions have inverses • Find inverse functions algebraically

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing	**1. F-IF.4** **2. F-IF.5**

key features given a verbal description of the relationship **2. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.** **3. Graph linear and quadratic functions and show intercepts, maxima, and minima** **4. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.** **5. Combine standard function types using arithmetic operations.** **6. Compose functions.** **7. Find inverse functions**	**3. F-IF.7a** **4. F-IF.7b** **5. F-BF.1b** **6. F-BF.1c** **7. F-BF.4**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- **Natural phenomena can be modeled by functions, such as the force of water against the face of a dam**
- **Graphs of functions provide a visual relationship between two variables, such as the graph of a step function can represent the cost of a telephone call**
- **Graphs of functions can be used to model the amount of fuel used by trucks**
- **Combinations of functions can be used to analyze US health care expenditures**
- **Inverse functions can be used to investigate the relationship between the exhaust temperature and the percent load on a diesel engine**

Students will engage with the following text:

Precalculus with Limits – A Graphing Approach

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing, and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

1.1 Functions

*** Honors only**

Big Ideas
Testing for Functions
Testing for Functions Represented Algebraically
Evaluating a Function

A Piecewise-Defined Function
Finding the Domain of a Function
The Dimensions of a Container
The Path of a Baseball
Direct Mail Advertising
Evaluating a Difference Quotient

1.2 Graphs of Functions

*** Honors only**

Big Ideas
Finding the Domain and Range of a Function
Vertical Line Test for Functions
Increasing and Decreasing Functions
Approximating a Relative Minimum
Approximating Relative Minimums and Maximum
Bowling Equipment Sales
Graphing a Piecewise-Defined Function
Testing for Evenness and Oddness
Even and Odd Functions

1.3 Shifting, Reflecting, and Stretching Graphs

*** Honors only**

Big Ideas
Shifts in the Graph of a Function
Finding Equations from Graphs
Reflections and Shifts
Non-rigid Transformations
Sequences of Non-rigid Transformations

1.4 Combinations of Functions

*** Honors only**

Big Ideas
Finding the Sum of Two Functions
Finding the Difference of Two Functions
Finding the Product of Two Functions
Finding the Quotient of Two Functions
Forming the Composition of f with g
Compositions of Functions
Finding the Domain of a Composite Functions
A Case in Which $f \circ g = g \circ f$
Identifying a Composite Function
Bacteria Count

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students doing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course tests, and SATs

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

<table>
<tr><td>Course/Unit Title:
Pre-Calculus/Unit 2 Polynomial and Rational Functions

Grade Level(s):
11 and 12</td><td>Unit Summary:
In this unit students will learn about quadratic functions, polynomial functions of higher degree, real zeros of polynomial functions, complex numbers, the fundamental theorem of algebra, rational functions and asymptotes and graphs of rational functions. They will sketch and analyze graphs of quadratic and polynomial functions. They will use long division and synthetic division to divide polynomials by other functions. They will determine the number of rational and real zeros of polynomial functions and find them. They will perform operations with complex numbers and plot complex numbers in the complex plane. The will determine the domain, find asymptotes, and sketch the graphs of rational functions.</td></tr>
<tr><td>Essential Question(s):
• What techniques are necessary to analyze and solve polynomials algebraically?
• How can polynomial-solving skills assist in solving rational equations?</td><td>Enduring Understanding(s):
Students will be able to:
• Analyze graphs of quadratic functions.
• Write quadratic functions in standard form and use the results to sketch graphs of functions.
• Use quadratic functions to model and solve real-life problems.
• Use transformations to sketch graphs of polynomial functions.
• Use the Leading Coefficient Test to determine the end behavior of graphs of polynomial functions.
• Find and use zeros of polynomial functions to sketch their graphs.
• Use the Intermediate Value Theorem to help locate zeros of polynomial functions.
• Use long division to divide polynomials by other polynomials.
• Use synthetic divisions to divide polynomials by binomials of the form (x – k).
• Use the Remainder Theorem and the Factor Theorem.
• Use the Rational Zero Test to determine possible rational zeros of polynomials functions.
• Determine upper and lower bound for zeros of polynomial functions.
• Use the imaginary unit I to write complex numbers.
• Add, subtract, and multiply complex numbers.
• Use complex conjugates to divide complex numbers.
• Plot complex numbers in the complex plane.
• Use the Fundamental Theorem of Algebra to determine the number of zeros of polynomial functions.
• Find all zeros of polynomial functions, including complex zeros.
• Find conjugate pairs of complex zeros.
• Find zeros of polynomials by factoring.
• Find domains of rational functions.
• Find horizontals and vertical asymptotes of graphs of rational functions.</td></tr>
</table>

	• Use rational functions to model and solve real-life problems. • Analyze and sketch graphs of rational functions. • Decide whether graphs of rational functions have slant asymptotes. • Use rational functions to model and solve real-life problems.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. Graph linear and quadratic functions and show intercepts, maxima, and minima. ***2.*** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ***3.*** Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. ***4.*** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. ***5.*** Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x - a is p(a), so p(a) = 0 if and only if (x - a) is a factor of p(x). ***6.*** Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real. ***7.*** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. ***8.*** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. ***9.*** Represent complex numbers and their operations on the complex plane. ***10.*** Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. ***11.*** Solve quadratic equations with real coefficients that have complex solutions. ***12.*** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	**1. F-IF.7a** **2. F-IF.7c** **3. F-IF.7d** **4. F-IF.8a** **5. A-APR.2** **6. N-CN.1** **7. N-CN.2** **8. N-CN.3** **9. N-CN.4** **10. N.CN.5** **11. N-CN.7** **12. N-CN.9**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Quadratic functions can be used to model data to analyze consumer behavior. For instance, Exercise 78

on page 146 shows how a quadratic function can model VCR usage in the United States.

- You can use polynomial functions to model various aspects of nature, such as the growth of a red oak tree, as shown in Exercise 98 on page 158.
- Polynomial division can help your rewrite polynomials that are used to model real-life problems. For instance, Exercise 87 on page 172 shows how polynomial division can be used to model the average monthly rates for cable television in the United States from 1988 through 1997.
- Complex numbers are used to model numerous aspects of the natural world, such as the importance of an electrical circuit, as shown in Exercise 83 on page 181.
- Being able to find zeros of polynomials functions is an important part of modeling real-life problems. For instance, Exercise 65 on page 188 shows how to determine whether a ball thrown with a given velocity can reach a certain height.
- Rational functions are convenient in modeling a wide variety of real-life problems, such as environmental scenarios. For instance, Exercise 31 on page 196 shows how to determine the cost of removing pollutants from a river.

Students will engage with the following text:

Precalculus with Limits: A Graphing Approach
Third Edition
Larson, Hostetler, Edwards

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

2.1 Quadratic Functions

*** Honors only**

Big Ideas
Graphing Simple Quadratic Functions
Identifying the Vertex of a Quadratic Function
Writing a Quadratic Function in Standard Form
Finding the Equation of a Parabola in Standard Form
Find the Maximum and Minimum of a Quadratic Function
Use Maximums and Minimums of Quadratic Functions to find height or area

2.2 Polynomial Functions of Higher Degree

*** Honors only**

Big Ideas
Sketching Transformations of Polynomial Functions
Applying the Leading Coefficient Test
Finding Zeros of a Polynomial Function
Analyzing a Polynomial Function
Finding a Polynomial Function with Given Zeros
Sketching the Graph of a Polynomial Function
Approximating the Zeros of a Function

2.3 Real Zeros of Polynomial Functions

*** Honors only**

Big Ideas
Long Division of Polynomials
Using Synthetic Division
Using the Remainder Theorem
Factoring a Polynomial: Repeated Division
Rational Zero Test with Leading Coefficient of 1
Using the Rational Zero Test
Finding Real Zeros of a Polynomial Function using the Rational Zero Test

2.4 Complex Numbers

*** Honors only**

Big Ideas
Adding and Subtracting Complex Numbers
Multiplying Complex Numbers
Dividing Complex Numbers
*Plotting Complex Numbers
*Members of the Mandelbrot Set

2.5 The Fundamental Theorem of Algebra

*** Honors only**

Big Ideas
Real Zeros and Polynomial Functions
Real and Complex Zeros of Polynomial Functions
Finding Zeros of a Polynomial Function
Finding a Polynomial with Given Zeros
Factoring a Polynomial
Finding the Zeros of a Polynomial Function Given One Complex Zero

2.6 Rational Functions and Asymptotes

*** Honors only**

Big Ideas
Finding the Domain of a Rational Function
Finding Horizontal Asymptotes
Finding a Function's Domain and Asymptotes
Graph with Two Horizontal Asymptotes
*Cost-Benefit Model
*Average Cost of Producing a Product

2.7 Graphs of Rational Functions

*** Honors only**

Big Ideas
Sketching the Graph of a Rational Function by hand
*Sketching the Graph of a Rational Function with a Slant Asymptote
*Finding a Minimum Area

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students performing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects.

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course Exam, and SATs.

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 3 Exponential and Logarithmic Functions **Grade Level(s):** **11/12**	**Unit Summary**: In this unit, students will learn about exponential and logarithmic functions and their graphs. Students will recognize and evaluate and graph both exponential and logarithmic functions. They will rewrite logarithmic functions with different bases. Students will learn about the properties of logarithms and use the properties to evaluate, rewrite, expand, or condense logarithmic expressions. Students will learn to solve exponential and logarithmic equations.
Essential Question(s): • How can the properties of exponential models be used to analyze situations? • How can the properties of logarithms and exponents be used to solve equations and analyze situations?	**Enduring Understanding(s):** Students will be able to: • Recognize and evaluate exponential functions with a base a • Graph exponential functions • Recognize, evaluate, and graph exponential functions with base e • Use exponential functions to model and solve real-life problems • Recognize and evaluate logarithmic functions with a base a • Graph logarithmic functions • Recognize, evaluate, and graph natural logarithmic functions • Use logarithmic functions to model and solve real-life problems • Rewrite logarithmic functions with different bases • Use properties of logarithms to evaluate or rewrite logarithmic expressions • Use properties of logarithms to expand or condense logarithmic expressions • Use logarithmic functions to model and solve real-life problems • Solve simple exponential and logarithmic equations • Solve more complicated exponential and equations • Solve more complicated logarithmic equations • Use exponential and logarithmic equations to model and solve real-life problems

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship	**1. F-IF.4** **2. F-IF.5** **3. F-IF.7e**
2. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**4. F-LE.1** **5. F-LE.1b**
3. Graph exponential and logarithmic functions, showing intercepts and end	**6. F-LE.1c**

behavior. **4. Distinguish between situations that can be modeled with linear functions and with exponential functions.** **5. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.** **6. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.** **7. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.** **8. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.**	**7. F-LE.3** **8. F-LE.4**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Exponential functions are useful in modeling data that increase or decrease quickly, such as modeling the amount of defoliation caused by a gypsy moth.
- Logarithmic functions are useful in modeling data that increase or decrease slowly, such as the minimum required ventilation rates in public school classrooms.
- Logarithmic functions can be used to model and solve real-life problems such as human memory.
- Exponential and logarithmic equations can be used to model and solve problems such as using a logarithmic function to model crumple zones for automobile crash tests.

Students will engage with the following text:

Precalculus with Limits – A Graphing Approach

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing, and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

3.1 Exponential Functions and Their Graphs

*** Honors only**

Big Ideas
Evaluating Exponential Expressions
Graphs of $y = a^x$
Graphs of $y = a^{-x}$
Transformations of Graphs of Exponential Functions
Approximation of the Number e
Evaluating the Natural Exponential Function
Graphing Natural Exponential Functions
Finding the Balance for Compound Interest
Finding Compound Interest
Radioactive Decay
Population Growth

3.2 Logarithmic Functions and Their Graphs

*** Honors only**

Big Ideas
Evaluating Logarithms
Evaluating Logarithms on a Calculator
Using Properties of Logarithms
Graphs of Exponential and Logarithmic Functions
Sketching the Graph of a Logarithmic Function
Transformations of Graphs of Logarithmic Functions
Evaluating the Natural Logarithmic Function
Using Properties of Natural Logarithms
Finding the Domains of Logarithmic Functions
*Human Memory Model

3.3 Properties of Logarithms

*** Honors only**

Big Ideas
Changing Bases Using Common Logarithms
Changing Bases Using Natural Logarithms
Using Properties of Logarithms
Expanding the Logarithm of a Product
Expanding the Logarithm of a Quotient
Condensing a Logarithmic Expression
*Finding a Mathematical Model

3.4 Solving Exponential and Logarithmic Equations

*** Honors only**

Big Ideas

	Solving Exponential Equations
	Solving an Exponential Equation in Quadratic Form
	Solving a Logarithmic Equation
	Checking for Extraneous Solutions
	The Change-of-Base Formula
	Approximating the Solution of an Equation
	Doubling an Investment
	Consumer Price Index for Sugar

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students doing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course tests, and SATs

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

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PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

<table>
<tr>
<td>Course/Unit Title:
Pre-Calculus/Unit 4 Trigonometric Functions
Grade Level(s):
11 and 12</td>
<td>Unit Summary:
In this unit students will learn about trigonometric functions. Students will describe an angle and convert between degree and radian measures. Students will identify a unit circle and its relationship to real numbers. They will graph the sine, cosine, tangent, cosecant, secant and cotangent functions. Students will evaluate trigonometric functions of any angle. Students will use fundamental trigonometric identities. Students will evaluate inverse trigonometric functions. They will evaluate the compositions of trigonometric functions. Finally, they will use trigonometric functions to model and solve real-life problems.</td>
</tr>
<tr>
<td>Essential Question(s):
• What are the standards regarding angles and their measure, and how are they used?
• How can the coordinate plane be used to accurately represent angles and their measure?
• What are the properties and identifying aspects of the graphs of trigonometric functions?
• What are the relationships between trigonometric functions and their inverses?
• How can we use trigonometric functions and their corresponding definitions to solve real-life problems involving directional bearing and harmonic motion?</td>
<td>Enduring Understanding(s):
Students will be able to:
• Describe angles.
• Use radian measure.
• Use degree measure.
• Convert between radians and degrees.
• Use angles to model and solve real-life problems.
• Identify a unit circle and its relationship to real numbers.
• Evaluate trigonometric functions using the unit circle.
• Use the domain and period to evaluate sine and cosine functions.
• Use a calculator to evaluate trigonometric functions.
• Evaluate trigonometric functions of acute angles.
• Use the fundamental trigonometric identities.
• Use a calculator to evaluate trigonometric functions.
• Use trigonometric functions to model and solve real-life problems.
• Evaluate trigonometric functions of any angle.
• Use reference angles to evaluate trigonometric functions.
• Evaluate trigonometric functions of real numbers.
• Sketch the graphs of basic sine and cosine functions.
• Use amplitude and period to help sketch the graphs of sine and cosine functions.
• Sketch translations of graphs of sine and cosine functions.
• Use sine and cosine functions to model real-life data.
• Sketch the graphs of tangent functions.
• Sketch the graphs of cotangent functions.
• Sketch the graphs of secant and cosecant functions.
• Sketch the graphs of damped trigonometric functions.
• Evaluate inverse sine functions.
• Evaluate other inverse trigonometric functions.
• Evaluate compositions of trigonometric functions.
• Solve real-life problems involving right triangles.
• Solve real-life problems involving directional bearings.</td>
</tr>
</table>

	• Solve real-life problems involving harmonic motion.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	**NJCCCS or CCS**
1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. ***2.*** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. ***3.*** Combine standard function types using arithmetic operations. ***4.*** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. ***5.*** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. ***6.*** Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. ***7.*** Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. ***8.*** Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. ***9.*** Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	**1. G.CO.1** **2. G.SRT.8** **3. F.BF.1b** **4. F.TF.1** **5. F.TF.2** **6. F.TF.5** **7. F.TF.6** **8. F.TF.7** **9. F.TF.8**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Radian measures of angles can be used to model and solve real-life problems. For instance can determine measures of angles through which figure skaters jump.
- Trigonometric functions are used to model the movement of an oscillating weight. For instance, the displacement from equilibrium of an oscillating weight suspended by a spring is modeled as a function of time.
- Trigonometric functions can approximate the height of a building.

- **Trigonometry can be used to model the average daily temperature in a city.**
- **The sine function can model natural phenomenon.**
- **The tangent function can be used to model and analyze the distance between a television camera and a parade unit.**
- **Inverse trigonometric functions can be uses to determine the relationship between the length of rope from a winch to a boat and the angle of elevation between them.**
- **Trigonometric functions can be used to model and solve bearing problems.**
- **Trigonometric functions can be used to model and solve problems with simple harmonic motion.**

Students will engage with the following text:

Precalculus with Limits: A Graphing Approach
Third Edition
Larson, Hostetler, Edwards

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

4.1 Radian and Degree Measure

*** Honors only**

Big Ideas
Sketching and Finding Coterminal Angles
Complementary and Supplementary Angles
Converting from Degrees to Radians
Converting from Radians to Degrees
Finding Arc Length
*Finding Linear Speed

4.2 Trigonometric Functions: The Unit Circle

*** Honors only**

Big Ideas
Evaluating Trigonometric Functions
Using the Period to Evaluate the Sine and Cosine
Using a Calculator to Evaluate the Trigonometric Functions

4.3 Right Triangle Trigonometry

*** Honors only**

Big Ideas
Evaluating Trigonometric Functions with Exact Values
Evaluating Trigonometric Functions of 45°.
Evaluating Trigonometric Functions of 30° and 60°.
Applying Trigonometric Identities to Solve Equations.
Using Trigonometric Identities to Transform Equations.
Using a Calculator to Evaluate Trigonometric Functions.
Solving Right Triangles.

4.4 Trigonometric Functions of Any Angle

*** Honors only**

Big Ideas
Evaluating Trigonometric Functions Given a Point
Evaluating Trigonometric Functions Given One Trigonometric Function and a Quadrant
Evaluating Trigonometric Functions of Quadrant Angles
Finding Reference Angles
Evaluating Trigonometric Functions of Non-acute Angles
Using Trigonometric Identities to Evaluate
Using a Calculator to Evaluate Non-acute Angles

4.5 Graphs of Sine and Cosine Functions

*** Honors only**

Big Ideas
Using Key Points to Sketch A Sine Curve
Scaling: Vertical Shrinking and Stretching
Scaling: Horizontal Stretching
Horizontal Translation
Vertical Translation
Finding an Equation for a Graph
*Finding a Trigonometric Model

4.6 Graphs of Other Trigonometric Functions

*** Honors only**

Big Ideas
Sketching the Graph of a Tangent Function
Sketching the Graph of a Tangent Function Using Translations
Sketching the Graph of a Cotangent Function
Comparing Trigonometric Graphs of Sine and Cosecant
Comparing Trigonometric Graphs of Cosine and Secant
*Analyzing a Damped Sine Curve

4.7 Inverse Trigonometric Functions
*** Honors only**

Big Ideas
Evaluating the Inverse Sine Function
Graphing the Arcsine Function
Evaluating Inverse Trigonometric Functions
Using Calculators for Inverse Trigonometric Functions
Using Inverse Properties
Evaluating Compositions of Functions

4.8 Applications and Models
*** Honors only**

Big Ideas
Solving a Right Triangle
Finding the Side of a Right Triangle
Finding an Angle of Depression or an Angle of Elevation
*Finding Directions in Terms of Bearings
*Writing the Equation for the Simple Harmonic Motion of a Ball

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students performing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects.

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course Exam, and SATs.

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 5 Analytic Trigonometry **Grade Level(s):** **11/12**	**Unit Summary**: In this unit, student will learn to use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions. Students will learn to verify trigonometric identities. They will use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations. Students will learn to use sum and difference formulas, power-reducing formulas, half-angle formulas, and product-sum formulas to rewrite and evaluate trigonometric functions.
Essential Question(s): • How can trigonometric identities assist in solving trigonometric equations and verifying unknown identities? • How can trigonometric values of angles that are not "special angles" be found analytically? • How can trigonometric functions be used to analyze properties of triangles?	**Enduring Understanding(s):** Students will be able to: • Recognize and write fundamental trigonometric identities. • Use fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions. • Verify trigonometric identities. • Use standard algebraic techniques to solve trigonometric equations. • Solve trigonometric equations of quadratic type. • Solve trigonometric equations involving multiple angles. • Use inverse trigonometric functions to solve trigonometric equations. • Use sum and difference formulas to evaluate trigonometric functions. • Use sum and difference formulas to verify identities and solve trigonometric equations. • Use multiple-angle formulas to rewrite and evaluate trigonometric functions. • Use power-reducing formulas to rewrite and evaluate trigonometric functions. • Use half-angle formulas to rewrite and evaluate trigonometric functions. • Use product-sum formulas to rewrite and evaluate trigonometric functions.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. **Prove the Pythagorean identity $sin^2\theta + cos^2\theta = 1$ and use it to calculate trigonometric ratios.** 2. **Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.**	**1. F-TF.8** **2. F-TF.9**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Fundamental trigonometric identities can be used to simplify an expression for the rate of change of a function.
- Trigonometric identities can be used to solve a problem about the coefficient of friction for an object on an inclined plane
- Solving a trigonometric equation can help answer questions about the position of the sun.
- The sum and difference formulas can be used to rewrite a trigonometric expression in a form that helps find the equation of a standing wave.
- The half-angle formula can be used to determine the apex angle of a sound wave cone from the speed of an airplane.

Students will engage with the following text:

Precalculus with Limits – A Graphing Approach

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing, and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

5.1 Using Fundamental Identities

*** Honors only**

Big Ideas
Using Identities to Evaluate a Function
Simplifying a Trigonometric Expression
Verifying Trigonometric Identities
Factoring Trigonometric Expressions
Simplifying Trigonometric Expression
Rewriting Trigonometric Expression
Trigonometric Substitution

5.2 Verifying Trigonometric Identities

*** Honors only**

Big Ideas
Verifying a Trigonometric Identity
Combining Fractions Before Using Identities
Verifying a Trigonometric Identity
Converting to Sines and Cosines
Verifying a Trigonometric Identity
Working with Each Side Separately
*Three Example from Calculus

5.3 Solving Trigonometric Equations

*** Honors only**

Big Ideas
Solving a Trigonometric Equation
Collecting Like Terms
Extracting Square Roots
Factoring
Factoring an Equation of Quadratic Type
Rewriting with a Single Trigonometric Function
Squaring and Converting to Quadratic Type
*Functions of Multiple Angles
Using Inverse Functions
Approximating Solutions
*Surface Area of a Honeycomb

5.4 Sum and Difference Formulas

*** Honors only**

Big Ideas
Evaluating a Trigonometric Function
Evaluating a Trigonometric Expression
*An Application of a Sum Formula
*Proving a Cofunction Identity
*Deriving Reduction Formulas
*An Application form Calculus
Solving a Trigonometric Equation

5.5 Multiple-Angle and Product-Sum Formulas

*** Honors only**

Big Ideas
Solving a Multiple-Angle Equation
Using Double-Angle Formulas in Sketching Graphs
Evaluating Functions Involving Double Angles
*Deriving a Triple-Angle Formula
*Reducing a Power
Using a Half-Angle Formula

	Solving a Trigonometric Equation
	*Writing Products as Sums
	*Using a Sum-to-Product Formula
	Solving a Trigonometric Equation
	Verifying a Trigonometric Identity

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students doing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course tests, and SATs

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 6 Additional Topics in Trigonometry **Grade Level(s):** 11 and 12	**Unit Summary**: In this unit students will learn about the Law of Sines and the Law of Cosines. The Law of Sines and Cosines will be used to solve oblique triangles. Students will learn how to find areas of oblique triangles. They will represent vectors as directed line segments and perform mathematical operation of vectors. Students will find direction angles for vectors and find the dot product of two vectors and use properties of the dot product.
Essential Question(s): • How can trigonometric functions be used to analyze properties of triangles? • How can vector quantities be accurately represented and manipulated?	**Enduring Understanding(s):** Students will be able to: • Use the Law of Sines to solve oblique triangles given AAS, ASA or SSA. • Find areas of oblique triangles. • Use the Law of Sines to model and solve real-life problems. • Use the Law of Cosines to solve oblique triangles given SSS or SAS. • Use the Law of Cosines to model and solve real-life problems. • Use Heron's Area Formula to find areas of triangles. • Represent vectors as directed line segments. • Write the component form of vectors. • Perform basic vector operations and represent vectors graphically. • Write vectors as linear combinations of unit vectors. • Use vectors to model and solve real-life problems. • Find the dot product of two vectors and use properties of dot product. • Find angles between vectors. • Determine whether two vectors are orthogonal. • Write vectors as sums of two vector components. • Use vector to find the work done by force.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. Apply trigonometry to general triangles ***2.*** Understand and apply the LAW OF SINES and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). ***3.*** Use special triangles to determine geometrically the values of sine, cosine, tangent for ¶/3, ¶/4 and ¶/6, and use the unit circle to express the values of sine, cosine, and tangent for ¶-x, ¶+x, and 2¶-x in terms of their values for x, where x is any real number. ***4.*** Understand that restricting a trigonometric function to a domain on which it is	**1. G-SRT.D** **2. G-SRT.11** **3. F-TF.3** **4. F-TF.6** **5. F-TF.8** **6. F-FT.9** **7. N-VM.1** **8. N-VM.2** **9. N-VM.3**

always increasing or always decreasing allows its inverse to be constructed. ***5.*** Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find sin(theta), cos(theta), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. ***6.*** Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. ***7.*** Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v). ***8.*** Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. ***9.*** Solve problems involving velocity and other quantities that can be represented by vectors. ***10.*** Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. ***11.*** Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. ***12.*** Understand vector subtraction v - w as v + (-w), where -w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.	**10. N-VM.4a** **11. N-VM.4b** **12. N-VM.4c**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Law of Sines can be uses to solve real-life problems involving oblique triangles. For instance exercise 35 on page 435 shows how the Law of Sines can be used to help determine the distance from a ranger station to a forest fire.
- Law of Cosines can be used to solve real-life problems involving oblique triangle. For instance, exercise 32 on page 442 shows how the Law of Cosines can be used to approximate the number of feet a baseball player must run to catch a ball.
- Vectors are used to analyze numerous aspects of everyday life. Exercise 78 on page 455 shows how vectors can determine the tension in the cables of two cranes lifting an object.
- Dot product of two vectors can be used to find the force necessary to deep a truck from rolling down a hill.

Students will engage with the following text:

PreCalculus with Limits: A Graphing Approach
Third Edition
Larson, Hostetler, Edwards

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

6.1 Law of Sines

*** Honors only**

Big Ideas
Given Two Angles and the Non-Included Side: Solve an Oblique Triangle
Given Two Angles and the Included Side: Solve an Oblique Triangle
Single Solution for the SSA Case
No Solution for the SSA Case
Two Solutions for the SSA Case
Finding the Area of an Oblique Triangle
*Using the Law of Sines Given Bearings
*Apply Law of Sines to Find Distances and Angles in Oblique Triangles that Occur in The Real World

6.2 Law of Cosines

*** Honors only**

Big Ideas
Given Three Sides: Solve the Oblique Triangle
Given Two Sides and the Included Angle: Solve the Oblique Triangle
Apply Law of Cosine to Real-Life Situations
Using Heron's Area Formula Find the Area of a Triangular Region

6.3 Vectors in the Plane

*** Honors only**

Big Ideas
Vector Representation by Directed Line Segments
Finding the Component Form of a Vector
Vector Operations
Finding a Unit Vector
Writing a Linear Combination of Unit Vectors
Finding Direction Angles of Vectors
Using Vectors to Determine Weight
Using Vectors to Find Speed and Direction

6.4 Vectors and Dot Product

*** Honors only**

Big Ideas
Finding Dot Products
Using Properties of Dot Products
Dot Products and Length
Finding the Angle Between Two Vectors
Determining Orthogonal Vectors
Decomposing a Vector into Components
Finding a Force
Finding Work

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS.
IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students performing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects.

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course Exam, and SATs.

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 7 **Grade Level(s):** **11/12**	**Unit Summary**: In this unit, student will learn to use fundamental trigonometric identities to evaluate trigonometric functions and simplify trigonometric expressions. Students will learn to verify trigonometric identities. They will use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations. Students will learn to use sum and difference formulas, power-reducing formulas, half-angle formulas, and product-sum formulas to rewrite and evaluate trigonometric functions.
Essential Question(s): • How can trigonometric identities assist in solving trigonometric equations and verifying unknown identities? • How can trigonometric values of angles that are not "special angles" be found analytically? • How can trigonometric functions be used to analyze properties of triangles?	**Enduring Understanding(s):** Students will be able to: • Recognize and write fundamental trigonometric identities. • Use fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions. • Verify trigonometric identities. • Use standard algebraic techniques to solve trigonometric equations. • Solve trigonometric equations of quadratic type. • Solve trigonometric equations involving multiple angles. • Use inverse trigonometric functions to solve trigonometric equations. • Use sum and difference formulas to evaluate trigonometric functions. • Use sum and difference formulas to verify identities and solve trigonometric equations. • Use multiple-angle formulas to rewrite and evaluate trigonometric functions. • Use power-reducing formulas to rewrite and evaluate trigonometric functions. • Use half-angle formulas to rewrite and evaluate trigonometric functions. • Use product-sum formulas to rewrite and evaluate trigonometric functions.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	NJCCCS or CCS
1. **Prove the Pythagorean identity $sin^2\theta + cos^2\theta = 1$ and use it to calculate trigonometric ratios.** 2. **Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.**	**1. F-TF.8** **2. F-TF.9**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Fundamental trigonometric identities can be used to simplify an expression for the rate of change of a function.
- Trigonometric identities can be used to solve a problem about the coefficient of friction for an object on an inclined plane
- Solving a trigonometric equation can help answer questions about the position of the sun.
- The sum and difference formulas can be used to rewrite a trigonometric expression in a form that helps find the equation of a standing wave.
- The half-angle formula can be used to determine the apex angle of a sound wave cone from the speed of an airplane.

Students will engage with the following text:

Precalculus with Limits – A Graphing Approach

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing, and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

5.1 Using Fundamental Identities

*** Honors only**

Big Ideas
Using Identities to Evaluate a Function
Simplifying a Trigonometric Expression
Verifying Trigonometric Identities
Factoring Trigonometric Expressions
Simplifying Trigonometric Expression
Rewriting Trigonometric Expression
Trigonometric Substitution

5.2 Verifying Trigonometric Identities

*** Honors only**

Big Ideas
Verifying a Trigonometric Identity
Combining Fractions Before Using Identities
Verifying a Trigonometric Identity
Converting to Sines and Cosines
Verifying a Trigonometric Identity
Working with Each Side Separately
Three Example from Calculus

5.3 Solving Trigonometric Equations

*** Honors only**

Big Ideas
Solving a Trigonometric Equation
Collecting Like Terms
Extracting Square Roots
Factoring
Factoring an Equation of Quadratic Type
Rewriting with a Single Trigonometric Function
Squaring and Converting to Quadratic Type
Functions of Multiple Angles
Using Inverse Functions
Approximating Solutions
Surface Area of a Honeycomb

5.4 Sum and Difference Formulas

*** Honors only**

Big Ideas
Evaluating a Trigonometric Function
Evaluating a Trigonometric Expression
An Application of a Sum Formula
Proving a Cofunction Identity
Deriving Reduction Formulas
An Application form Calculus
Solving a Trigonometric Equation

5.5 Multiple-Angle and Product-Sum Formulas

*** Honors only**

Big Ideas
Solving a Multiple-Angle Equation
Using Double-Angle Formulas in Sketching Graphs
Evaluating Functions Involving Double Angles
Deriving a Triple-Angle Formula
Reducing a Power
Using a Half-Angle Formula

	Solving a Trigonometric Equation
	Writing Products as Sums
	Using a Sum-to-Product Formula
	Solving a Trigonometric Equation
	Verifying a Trigonometric Identity

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students doing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course tests, and SATs

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications:

Black Horse Pike Regional School District Curriculum Template

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

PART I: UNIT RATIONALE

WHY ARE STUDENTS LEARNING THIS CONTENT AND THESE SKILLS?

Course/Unit Title: Pre-Calculus/Unit 10 Topics in Analytic Geometry **Grade Level(s):** 11 and 12	**Unit Summary**: In this unit students will learn rewrite sets of parametric equations as rectangular equations and find sets of parametric equations for graphs. Students will write equations in polar form and graph polar equations. Students will recognize special polar graphs.
Essential Question(s): • How can we rewrite sets of parametric equations as single rectangular equations? • What are the basic components and attributes of the polar coordinate plane? • How can polar and rectangular equations be interchanged in order to more efficiently analyze given situations?	**Enduring Understanding(s):** Students will be able to: • Evaluate sets of parametric equations for given values of the parameter. • Graph curves that re represented by sets of parametric equations. • Rewrite sets of parametric equations as single rectangular equations by eliminating the parameter. • Find sets of parametric equations for graphs. • Plot points and find multiple representations of points in the polar coordinate system. • Convert points from rectangular to polar form and vice versa. • Convert equations from rectangular to polar form and vice versa. • Graph polar equations by point plotting. • Use symmetry, zeros, and maximum r-values as graphing aids. • Recognize special polar graphs.

PART II: INSTRUCTIONAL STRATEGIES AND RESOURCES

DESCRIBE THE LEARNING TARGETS.

After each target, identify the NJCCCS or Common Core Standards that are applicable

Learning Target	**NJCCCS or CCS**
1. Analyze functions using different representations ***2.*** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ***3.*** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. ***4.*** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. ***5.*** Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	**1. F-IF.C** **2. F-IF.7** **3. F-TF.1** **4. F-TF.2** **5. F-TF.4**

Inter-Disciplinary Connections:

Real-World problem solving examples:

- Parametric equations are useful for modeling the path of an object. For instance, in exercise 59 on page 738, a set of parametric equation is used to model the path of a baseball.
- Polar coordinates offer a different mathematical perspective on graphing. In exercises 5 – 12 on page 743, you see that a polar coordinate can be written in more than one way.
- Several common figures, such as the circle in exercise 3 on page 752, are easier to graph in polar coordinate system than in the rectangular coordinate system

Students will engage with the following text:

Precalculus with Limits: A Graphing Approach
Third Edition
Larson, Hostetler, Edwards

Students will write:

Students use Cornell Note taking strategies to reinforce vocabulary, writing and study skills.

PART III: TRANSFER OF KNOWLEDGE AND SKILLS

DESCRIBE THE LEARNING EXPERIENCE.

How will students uncover content and build skills.

10.5 Parametric Equation

*** Honors only**

Big Ideas
Using a Graphing Utility in Parametric Mode
Eliminating the Parameter
Finding Parametric Equations for a Given Graph

10.6 Polar Coordinates

*** Honors only**

Big Ideas
Plotting Point in the Polar Coordinate System
Multiple Representation of Points
Polar-to-Rectangular Conversion
Rectangular-to-Polar Conversion
Converting Polar Equations to Rectangular Form
Converting Rectangular Equations to Polar Form

10.7 Graphs of Polar Equations

*** Honors only**

Big Ideas
Graphing a Polar Equation by Point Plotting
*Using Symmetry to Sketch a Polar Graph
*Finding Maximum r-Values of a Polar Graph
*Analyzing a Polar Graph
*Analyzing a Rose Curve
*Analyzing a Lemniscate

PART IV: EVIDENCE OF LEARNING

IDENTIFY THE METHODS BY WHICH STUDENTS WILL DEMONSTRATE THEIR UNDERSTANDING OF CONTENT AND THEIR ABILITY TO APPLY SKILLS. IDENTIFY BLOOM'S LEVELS.

Formative Assessments:

The effectiveness of the instructional program will be based on teacher observations, students performing quality work together, questioning strategies, self and peer assessments, student record-keeping, quizzes, essays, journal writing, performance tasks, diagnostic tests, homework, and projects.

Accommodations/Modifications:

Summative Assessments:

Periodic benchmark tests, chapter tests, state assessments, PSATs, End of Course Exam, and SATs.

Accommodations/Modifications:

Performance Assessments:

Projects, display of student work, and electronic portfolios

Accommodations/Modifications: