SUBJECT: Honor Precalculus	GRADE: 9-12
Unit 1: Functions and Graphs	**Time Frame: 6 weeks**

UNIT OVERVIEW

- How are equations solved and used to model real life problems?
- What are functions and how are they analyzed?
- How are functions graphed?
- How real life problems are modeled using functions?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS

• Creativity and Innovation 9-12: Creative Collaborative Graphing Assignment (S3C)
  ○ Using digital tools to explore the transformations of the 12 basic functions.
• Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4C)
  ○ Conferencing about students achievement levels on Topic Check for Understandings
	CC.2.1.HS.F.4
	CC.2.2.HS.C.1
	CC.2.2.HS.C.2
	CC.2.2.HS.C.3
	CC.2.2.HS.C.4
	CC.2.2.HS.C.5
	CC.2.2.HS.C.6
	CC.2.2.HS.D.8
	CC.2.4.HS.B.3

COMPETENCIES	LEARNING TARGETS
Equations and Inequalities I can create and solve equations and inequalities that represent mathematical situations.	**Model & Solve Equations** I can model and solve equations. (K1MAB5R1)
Patterns, Functions, Multiple Rep I can identify, create, and evaluate functions using multiple representations	**Function Properties** • I can identify functions and their properties. (K1MAB6R1) **Combine Functions** • I can combine functions algebraically. (K1MAB6R2) **Parametric Relations** • I can define relations parametrically. (K1MAB6R3) **Inverse Functions**

	● I can find the inverse of a function. (K1MAB6R4) **Transformations** ● I can recognize function transformations. (K1MAB6R5) **Function Modeling** ● I can model using functions from formulas, graphs, descriptions and data. (K1MAB6R6)

SUBJECT: Honor Precalculus	**GRADE: 9-12**
Unit 2: Polynomial, Power and Rational Functions	**Time Frame: 6 weeks**

UNIT OVERVIEW

- What are linear and quadratic functions?
- What are power and higher degree polynomial functions?
- How are zeros of functions calculated?
- How are rational functions graphed?
- How are rational equations solved?
- How are polynomial, rational and other inequalities solved?

LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Collaboration and Teamwork 9-12: Quadratic Equation Solution Methods (S1C) ○ Using station rotation to explore the different methods for solving quadratic equations. ● Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4C) ○ Conferencing about students achievement levels on Topic Check for Understandings	CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.1.HS.F.6 CC.2.1.HS.F.7 CC.2.2.HS.D.2 CC.2.2.HS.D.4 CC.2.2.HS.D.5 CC.2.2.HS.D.6 CC.2.2.HS.D.7 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3

	CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6
COMPETENCIES	**LEARNING TARGETS**
Equations and Inequalities I can create and solve equations and inequalities that represent mathematical situations.	**Rational Equations** ● I can solve rational equations. (K1MAB5R2) **Polynomial & Rational Inequalities** ● I can solve polynomial, rational and other inequalities. (K1MAB5R3)
Patterns, Functions, Mult Rep I can identify, create, and evaluate functions using multiple representations.	**Linear & Quadratic Models** ● I can use data sets to create linear and quadratic models. (K1MAB6R7) **End Behavior** ● I can describe end behavior of functions. (K1MAB6R8) **Rational Zeros** ● I can use factoring, long division and synthetic division to find rational zeros. (K1MAB6R9) **Real & Complex Zeros** ● I can find real and complex zeros. (K1MAB6R10)
Graphing I can create and interpret graphs as visual representations of the relationship between quantities.	**Linear & Quadratic Graphs** ● I can graph linear and quadratic functions. (K1MAB7R1) **Power & Polynomial Graphs** ● I can graph power and polynomial functions of higher degree. (K1MAB7R2) **Rational Function Graphs** ● I can graph rational functions using end behavior and asymptotes. (K1MAB7R3)

SUBJECT: Honor Precalculus	GRADE: 9-12
Unit 3: Exponential, Logistic and Logarithmic Functions	**Time Frame: 6 weeks**

UNIT OVERVIEW

- What are exponential and logistic functions and how are they used to model growth and decay?
- What are logarithmic functions and their properties?
- How are exponential, logistic and logarithmic functions graphed?
- How are exponential and logarithmic functions solved?
- How are exponential models used in the mathematics of finance?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
● Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4C) ○ Conferencing about students achievement levels on Topic Check for Understandings	CC.2.1.HS.F.3 CC.2.1.HS.F.4 CC.2.2.HS.D.2 CC.2.2.HS.D.7 CC.2.2.HS.D.8 CC.2.2.HS.D.9 CC.2.2.HS.D.10 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.5 CC.2.2.HS.C.6

COMPETENCIES	LEARNING TARGETS
Equations and Inequalities I can create and solve equations and inequalities that represent mathematical situations.	**Log Equations** ● I can use the properties of logarithms to solve equations. (K1MAB5R4) **Exp, Log, Logistic Equations** ● I can solve exponential, logistic, and logarithmic equations algebraically. (K1MAB5R5)

Patterns, Functions, Mult Rep I can identify, create, and evaluate functions using multiple representations.	**Exp, Log, Logistic Models** ● I can use exponential, logistic and logarithmic functions to model and solve real life applications. (K1MAB6R11) **Finance** ● I can apply and use interest formulas to solve the mathematics of finance applications. (K1MAB6R12)
Graphing I can create and interpret graphs as visual representations of the relationship between quantities.	**Exp, Log, Logistic Graphs** ● I can graph exponential, logistic and logarithmic functions. (K1MAB7R4)

SUBJECT: Honor Precalculus	**GRADE: 9-12**
Unit 4: Trigonometric Functions	**Time Frame: 6 weeks**

UNIT OVERVIEW

- How are angles measured in degrees and radians?
- How is arc length calculated?
- How are angular and linear speeds related?
- How are trigonometric functions of acute angles evaluated?
- How are trigonometric functions used to solve right triangles?
- What is the unit circle and how is it used to evaluate trigonometric functions of real numbers?
- How are the trigonometric functions graphed?
- How are the inverse trigonometric functions used to solve trigonometric equations?
- How are right triangle and simple harmonic motion problems solved?

LRG SKILLS AND DISPOSITIONS	**PA STANDARDS**
● Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4C) ○ Conferencing about students achievement levels on Topic Check for Understandings	CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.4 CC.2.2.HS.C.6 CC.2.2.HS.C.7

	CC.2.2.HS.C.8 CC.2.3.HS.A.7 CC.2.3.HS.A.9
COMPETENCIES	**LEARNING TARGETS**
Patterns, Functions, Mult Rep I can identify, create, and evaluate functions using multiple representations.	**Trig Functions** ● I can identify trigonometric functions and their inverses under transformations. (K1MAB6R13) **Trig Function Inverses** ● I can find the inverses of the basic trigonometric functions. (K1MAB6R14)
Graphing I can create and interpret graphs as visual representations of the relationship between quantities.	**Trig Function Graphs** ● I can graph trigonometric functions and their inverses under transformations. (K1MAB7R5)
Geometry I can describe, analyze, and apply geometric relationships to solve problems.	**Angle Measurement** ● I can convert between radians and degrees and between angular and linear speed. (K1MAB9R1) **Right Triangles** ● I can solve right triangles. (K1MAB9R2) **Special Right Triangles** ● I can identify and use the ratios of special right triangles. (K1MAB9R3) **Unit Circle** ● I can use the unit circle to evaluate trigonometric functions of special angles. (K1MAB9R4) **Trig Applications** ● I can solve right triangle and simple harmonic motion problems. (K1MAB9R5)

SUBJECT: Honor Precalculus	GRADE: 9-12
Unit 5: Analytic Trigonometry	**Time Frame: 6 weeks**

UNIT OVERVIEW

- What are the fundamental identities of trigonometric functions?
- How are the fundamental identities used to solve trigonometric equations?
- How are trigonometric identities proved?
- What are the sum and difference identities?
- What are the double angle and half angle identities and how are they used to solve equations?
- What are the laws of sines and cosines and how are they used to solve applications?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
● Critical Thinking & Problem Solving: Proofs (S4C) ○ Proof presentations ● Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4C) ○ Conferencing about students achievement levels on Topic Check for Understandings	CC.2.2.HS.D.9 CC.2.2.HS.C.9 CC.2.3.HS.A.14
COMPETENCIES	**LEARNING TARGETS**
Equations and Inequalities I can create and solve equations and inequalities that represent mathematical situations.	**Trig Equations** ● I can use identities to solve equations. (K1MAB5R6) **Laws of Sines & Cosines** ● I can solve equations and applications using the laws of sines and cosines. (K1MAB5R7)
Logic and Reasoning I can identify, state, and construct valid arguments to prove statements with mathematical logic and reasoning.	**Trig Identities** ● I can identify the trigonometric identities. (K1MAB8R1) **Trig Identity Proofs** ● I can prove identities. (K1MAB8R2)

SUBJECT: Honor Precalculus	GRADE: 9-12
Unit 6: Applications of Trigonometry	**Time Frame: 6 weeks**

UNIT OVERVIEW

- What are two dimensional vectors and vector operations?
- What is a direction angle?
- What is the dot product?
- What are parametric equations?
- How are parametric curves defined?

LRG SKILLS AND DISPOSITIONS	PA STANDARDS
● Resilience and Grit 9-12: Successful completion of Topic Check for Understandings (D4) ○ Conferencing about students achievement levels on Topic Check for Understandings	CC.2.3.HS.A.14 CC.2.2.HS.C.1 CC.2.2.HS.C.2 CC.2.2.HS.C.3 CC.2.2.HS.C.6 CC.2.2.HS.C.8

COMPETENCIES	LEARNING TARGETS
Operations and Expressions I can generate equivalent expressions using operations and mathematical properties.	**De Moivre's Theorem and nth Roots** ● I can perform operations on complex numbers.
Equations and Inequalities I can create and solve equations and inequalities that represent mathematical situations.	**Parametric Equations** ● I can solve parametric equations. (K1MAB5R8) **The Euler's Formula** ● I can use the Euler's Formula to find the roots of a complex equation.
Graphing I can create and interpret graphs as visual representations of the relationship between quantities.	**Parametric Graphs** ● I can graph parametric equations. (K1MAB7R6) **Motion Simulation** ● I can simulate motion with a grapher. (K1MAB7R7) **Polar Coordinates**

	● I can identify, convert, and find distance using polar coordinates. **Polar Equation Graphs** ● I can generate and analyze polar equation graphs.
Geometry I can describe, analyze, and apply geometric relationships to solve problems.	**Vector Operations** ● I can perform vector operations on two dimensional vectors. (K1MAB9R6) **Direction and Magnitude** ● I can find unit vectors and direction angles. (K1MAB9R7) **Dot Product** ● I can find the dot product and angle between two vectors. (K1MAB9R8)