Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 1 - Systems of Equations	
Big Idea: Solving linear systems and nonlinear systems of equations	
PA Content Standards: A2.1.3.1 Write and/or solve non-linear equations using various methods. A2.1.3.2 Describe and/or determine change. A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.2 Describe and/or determine families of functions.	**PA Core Standards:** 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. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I solve a system of equations with three variables algebraically? How do I use a system of equations with three variables to solve word problems? How do I solve nonlinear system of equations involving circles, quadratics, and rational equations by substitution? How do I solve nonlinear system of equations involving circles, quadratics, and rational equations by elimination?	**Understandings (SWKT…):** ● Solve systems of equations with 3 variables algebraically ● Use systems of equations to solve word problems ● Solve nonlinear systems of equations involving lines, circles, parabolas, and rational equations by *substitution* ● Solve nonlinear systems of equations involving lines, circles, parabolas, and rational equations by *elimination*

Vocabulary:	**Skills (SWBAT…):**
System of Equations Elimination Substitution	● Students will be able to solve a system of equations with three variables algebraically. ● Students will be able to use a system of equations with three variables to solve word problems. ● Students will be able to solve nonlinear system of equations involving circles, quadratics, and rational equations by substitution. ● Students will be able to solve nonlinear system of equations involving circles, quadratics, and rational equations by elimination.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Elizabethtown Area School District Curriculum Date Adopted:

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 2 - Function Transformations	
Big Idea: Understanding transformed graphs and equations	
PA Content Standards: A2.1.3.1 Write and/or solve non-linear equations using various methods. A2.1.3.2 Describe and/or determine change. A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables. A2.2.2.2 Describe and/or determine families of functions.	**PA Core Standards:** 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.4 Interpret the effects transformations have on functions, and find the inverses of functions. CC.2.2.HS.C.6 Interpret functions in terms of the situations they model. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

	CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I identify parent graphs and their equations? What transformations exist in this graph or equation? How do I write the equation for a transformed parent function from a graph or description? How do I find the inverse of a function given a table, equation, or graph? How do I determine if the inverse is a function? How do I verify if two functions are inverses?	**Understandings (SWKT…):** ● Identify parent graphs and their equations ● State transformations given a graph or equation ● Write equations for transformed parent functions given a graph or description ● **F**ind the inverse of a function given a table, equation, or graph ● Determine if the inverse is a function ● Verify two functions are inverses by performing a composition of functions
Vocabulary: Transformation Reflection Dilation Translation Function Inverse Vertical Line Test	**Skills (SWBAT…):** ● Students will be able to identify parent graphs and their equations. ● Students will be able to state transformations given a graph or equation. ● Students will be able to write the equation for a transformed parent function given a graph or description. ● Students will be able to find the inverse of a function given a table, equation, or graph. ● Students will be able to determine if the inverse is a function. ● Students will be able to verify two functions are inverses by performing a composition of functions.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 3 - Analyzing Graphs	
Big Idea: Understanding domain and range, continuity, asymptotes, end behavior, intervals of increasing/decreasing, and extrema	
PA Content Standards: A2.1.3.1 Write and/or solve non-linear equations using various methods. A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables. A2.2.2.2 Describe and/or determine families of functions.	**PA Core Standards:** 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.4 Interpret the effects transformations have on functions, and find the inverses of functions. CC.2.2.HS.C.6 Interpret functions in terms of the situations they model. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I work with piecewise functions? How do I find the equations of asymptotes for rational functions? How do I state the domain and range of a function using interval notation? How do I determine whether a graph is continuous? How do I know the difference between removable and nonremovable discontinuities? How do I describe the end behavior of a function? How do I identify critical points on a graph and determine the type of critical point?	**Understandings (SWKT…):** ● Evaluate a piecewise function ● Write and graph a piecewise function ● Match the equation for a piecewise function to a graph ● Find holes and slant, horizontal, and vertical asymptotes of rational functions ● State domain and range using interval notation ● Determine whether a graph is continuous or discontinuous at a point by using the 3 tests for continuity ● Understand the difference between removable and nonremovable discontinuities ● Describe the end behavior of a function ● Identify and label critical points

How do I determine intervals where a function is increasing and intervals where a function is decreasing?	● Determine intervals where a function is increasing and decreasing
Vocabulary: Piecewise Function Domain Range Asymptote Hole Rational Function Continuity End Behavior Critical Point Minimum Maximum Relative Absolute Point of Inflection Increasing Decreasing	**Skills (SWBAT…):** ● Students will be able to evaluate a piecewise function, sketch a graph of a piecewise function, and match the equation for a piecewise function to a graph. ● Students will be able to find holes and the equations of slant, horizontal, and vertical asymptotes of rational functions. ● Students will be able to state domain and range using interval notation. ● Students will be able to determine whether a graph is continuous or discontinuous at a point by using the 3 tests for continuity. ● Students will know the difference between removable and nonremovable discontinuities. ● Students will be able to describe the end behavior of a function. ● Students will be able to identify and label critical points. ● Students will be able to determine intervals where a function is increasing and decreasing.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Elizabethtown Area School District Curriculum Date Adopted:

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 4 - Logarithmic and Exponential Functions	

Big Idea: Simplifying expressions and solving equations involving logarithms and exponents	
PA Content Standards: A2.1.2.1 Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems. A2.1.3.1 Write and/or solve non-linear equations using various methods. A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables. A2.2.2.2 Describe and/or determine families of functions.	**PA Core Standards:** 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.5 Construct and compare linear, quadratic, and exponential models to solve problems. CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents. CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I simplify expressions involving exponents? How do I rewrite an expression involving a rational exponent? How do I simplify expressions involving logarithms? How do I solve equations involving logarithms and exponents? How do I write equations for and describe exponential and logarithmic functions involving rigid transformations? How do I use the graphs of exponential and logarithmic functions to model real world situations?	**Understandings (SWKT…):** ● Simplify expressions involving exponents ● Rewrite an expression involving a rational exponent ● Simplify expressions involving logarithms ● Solve equations involving logarithms and exponents ● Use the change of base formula for logarithms ● Write equations for and describe exponential and logarithmic functions involving rigid transformations ● Use the graphs of exponential and logarithmic functions to model real world situations.

Vocabulary:	**Skills (SWBAT…):** ● Students will be able to simplify expressions involving exponents. ● Students will be able to rewrite an expression involving a rational exponent. ● Students will be able to simplify expressions involving logarithms. ● Students will be able to solve equations involving logarithms and exponents ● Students will be able to use the change of base formula for logarithms. ● Students will be able to write equations for and describe exponential and logarithmic functions involving rigid transformations. ● Students will be able to use the graphs of exponential and logarithmic functions to model real world situations.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Elizabethtown Area School District Curriculum Date Adopted:

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 5 - Polynomial & Complex Equations	
Big Idea: Writing and solving polynomial equations; solving rational and radical equations	
PA Content Standards: A2.1.1.1 Represent and/or use imaginary numbers in equivalent	**PA Core Standards:** CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to

forms A2.1.3.2 Describe and/or determine change. A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables.	solve problems. CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems. CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers. CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems. CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
<u>Essential Questions</u>: How do I can find the roots (including repeated roots) of a polynomial equation? How do I write a polynomial equation given the roots or a graph? How do I solve a quadratic equation? How do I solve a higher order polynomial equation? How do I find the equation for a polynomial model with my graphing calculator? How do I solve rational equations? How do I solve radical equations (including equations with rational exponents)?	**<u>Understandings (SWKT…)</u>:** ● Find the roots (including repeated roots) of a polynomial equation ● Identify the number and type of solutions a polynomial equation will have ● Write a polynomial equation given the roots or a graph ● Solve a quadratic equation by completing the square and using the quadratic formula ● Solve a higher order polynomial equation using the Rational Root Theorem, synthetic division, factoring, and the quadratic formula. ● Determine which degree of polynomial is most appropriate for real world data. ● Find the equation for a polynomial model with a graphing calculator ● Solve rational equations ● Solve radical equations (including equations with rational exponents)

Vocabulary:	**Skills (SWBAT…):**
Root Zero Completing the Square Rational Root Theorem Synthetic Division Degree	● Students will be able to find the roots (including repeated roots) of a polynomial equation. ● Students will be able to Identify the number and type of solutions a polynomial equation. ● Students will be able to write a polynomial equation given the roots or a graph. ● Students will be able to solve a quadratic equation by completing the square and using the quadratic formula. ● Students will be able to solve a higher order polynomial equation using the Rational Root Theorem, synthetic division, factoring, and the quadratic formula. ● Students will be able to determine which degree of polynomial is most appropriate for real world data. ● Students will be able to find the equation for a polynomial model with a graphing calculator. ● Students will be able to solve rational equations. ● Students will be able to solve radical equations (including equations with rational exponents).
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 6 - Conic Sections	
Big Idea: Understanding the graphs and equations associated with conic sections	
PA Content Standards: A2.2.1.1 Analyze and/or use patterns or relations. A2.2.2.1 Create, interpret, and/or use polynomial, exponential, and/or logarithmic functions and their equations, graphs, or tables.	**PA Core Standards:** CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I identify, sketch, and write equations of conic sections?	**Understandings (SWKT…):** ● Sketch the graph of a circle ● Write the equation of a circle in standard and general form. ● Sketch the graph of an ellipse ● Write the equation of an ellipse in standard and general form. ● Sketch the graph of a hyperbola ● Write the equation of a hyperbola in standard and general form. ● Sketch the graph of a parabola ● Write the equation of a parabola in standard and general form.
Vocabulary: Conic Sections Circle Ellipse Hyperbola Parabola Vertex Center Radius Directrix Focus	**Skills (SWBAT…):** ● Students will be able to identify, sketch, and write equations of conic sections (circles, ellipses, hyperbolas, parabolas).

Assessments:	**Resources:**
Quizzes, Homework, Assignments, Tests	Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety of online resources, Desmos

Elizabethtown Area School District Curriculum Date Adopted:

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 7 - Circular and Triangle Trigonometry	
Big Idea: Developing and understanding the unit circle; applying trigonometric functions	
PA Content Standards: G.2.1.1 Solve problems involving right triangles. G.2.1.2 Solve problems using analytic geometry.	**PA Core Standards:** CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios. CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles. CC.2.3.8.A.3 Understand and apply the Pythagorean theorem to solve problems. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. Law of Sines and Law of Cosines: CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How can I identify and use angles in trigonometry? How do I use the six trigonometric ratios? How do I solve a right triangle?	**Understandings (SWKT…):** ● Understand and draw angles in standard position ● Find coterminal angles (both positive and negative) ● Find the reference angle for a given angle

How do I use the unit circle? How do I use the Law of Sines and Law of Cosines?	● Find the six trigonometric ratios given a triangle or given a point on the coordinate plane or given a single trigonometric ratio. ● Evaluate trigonometric and inverse trigonometric expressions ● Solve right triangles by using trigonometric ratios to find the missing sides and angles ● Construct the Unit Circle using degree measurements and special right triangles. ● Use the Law of Sines and Law of Cosines to find missing sides and angles in triangles.
Vocabulary: Standard Position Coterminal Angles Reference Angle Unit Circle Law of Sines Law of Cosines	**Skills (SWBAT…):** ● Students will understand and draw angles in standard position, find coterminal angles (both positive and negative), and find reference angles for a given angle. ● Students will be able to find the six trigonometric ratios given a triangle or given a point on the coordinate plane or given a single trigonometric ratio. ● Students will be able to evaluate trigonometric and inverse trigonometric expressions. ● Students will be able to solve right triangles by using trigonometric ratios to find the missing sides and angles. ● Students will be able to construct the Unit Circle using degree measurements and special right triangles. ● Students will be able to use the Law of Sines and Law of Cosines to find missing sides and angles in triangles.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 8 - Radian Measure and Trigonometric Graphs	
Big Idea: Understanding radian measure and the graphs of the six trigonometric functions	
PA Content Standards:	**PA Core Standards:** CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions. CC.2.3.HS.A.9 Determine arc lengths and areas of sectors of circles. CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs Linear & Angular Velocity Word Problems: CC.2.2.HS.C.6 Interpret functions in terms of the situations they model. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: What is radian measure? How do I calculate linear velocity and angular velocity for circular motion? How do I graph the six trigonometric functions?	**Understandings (SWKT…):** ● Convert between radians and degrees ● Label the Unit Circle using radians ● Find trig ratios using radian measures on the Unit Circle ● Find arc length and sector area using radians or degrees ● Understand the difference between and calculate linear velocity and angular velocity for circular motion.

	● Match graph transformations of each parent function of the six trigonometric functions ● Find the midline, amplitude, period, and phase shift ● Write the equation given a graph or information about the graph
Vocabulary: Radians Linear Velocity Angular Velocity Midline Amplitude Period Phase Shift	**Skills (SWBAT…):** ● Students will be able to convert between radians and degrees ● Students will be able to label the Unit Circle using radians ● Students will be able to find trig ratios using radian measures on the Unit Circle ● Students will be able to find arc length and sector area using radians or degrees ● Students will be able to understand the difference between and calculate linear velocity and angular velocity for circular motion. ● Students will be able to match graph transformations of each parent function of the six trigonometric functions. ● Students will be able to find the midline, amplitude, period, and phase shift. ● Students will be able to write the equation given a graph or information about the graph.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Grade, Subject: 9th - 12th; Honors Precalculus	

Strand (Unit): Unit 9 - Trigonometric Identities	
Big Idea: Using trigonometric identities to simplify expressions and solve equations	
PA Content Standards:	**PA Core Standards:** CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context. CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems. CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios. G.1.3.2.1, G.2.1.1.1, G.2.1.1.2 CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: How do I use trigonometric identities? How do I use Sum and Difference Identities? How do I use Double Angle and Half Angle Identities? How do I solve a trigonometric equation?	**Understandings (SWKT…):** ● Know the reciprocal, quotient, Pythagorean, and opposite angle trig identities ● Use trigonometric identities to simplify expressions, verify equations, and find a numerical value for a trigonometric function given an equation. ● Use Sum and Difference Identities ● Use Double Angle and Half Angle Identities ● Solve trigonometric equations in degrees and radians
Vocabulary: Trigonometric Identity	**Skills (SWBAT…):** ● Students will know the reciprocal, quotient, Pythagorean, and opposite angle trig identities. ● Students will be able to use trigonometric identities to simplify expressions, verify equations, and find a numerical value for a trigonometric function given an equation. ● Students will be able to use Sum and Difference Identities. ● Students will be able to use Double and Half Angle Identities. ● Students will be able to solve trigonometric equations in degrees and radians using all the trigonometric identities to simplify if needed.

Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos

Elizabethtown Area School District Curriculum Date Adopted:

Grade, Subject: 9th - 12th; Honors Precalculus	
Strand (Unit): Unit 10 - Sequences, Series, and Sums	
Big Idea: Understanding arithmetic and geometric sequences and series; understanding sigma notation	
PA Content Standards:	**PA Core Standards:** CC.2.2.HS.C.3 Write functions or sequences that model relationships between two

	quantities. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. 13.3.11.E: Evaluate time management strategies and their application to both personal and work situations. 13.1.11.E: Justify the selection of a career.
Essential Questions: I know the difference between and can find terms in an arithmetic or geometric sequence. I can express a series using sigma notation and can find a series from sigma notation.	**Understandings (SWKT…):** ● Know the difference between and find terms in an arithmetic or geometric sequence ● Express a series using sigma notation ● Find a series from sigma notation
Vocabulary: Arithmetic Geometric Sequence Series Sigma Notation Terms	**Skills (SWBAT…):** ● Students will know the difference between and be able to find terms in an arithmetic or geometric sequence. ● Students will be able to express a series using sigma notation. ● Students will be able to find a series from sigma notation.
Assessments: Quizzes, Homework, Assignments, Tests	**Resources:** Teacher created materials, worksheets, notes packets, textbooks, Chromebooks, Schoology, variety online resources, Desmos