Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Functions & Linear Equations**

Time Allotment: 2 weeks **Unit Sequence: 1**

Major Concepts to be learned:

- Function.
- Slope.

Expected Skills to be demonstrated:

- Test a relation to determine whether it is a function.
- Identify the domain and range of a relation.
- Find compositions, zeros, and inverses of functions.
- Find the slope, distance and midpoint given two points.
- Find the equation (in slope-intercept or general form) for a line given two points and graph.
- Identify parallel and perpendicular lines.

PA Standards/Anchors:

CC.2.1.HS.F.4
CC.2.2.HS.D.1
CC.2.2.HS.D.2
CC.2.2.HS.D.8
CC.2.2.HS.D.10
CC.2.2.HS.C.1
CC.2.2.HS.C.3
CC.2.2.HS.C.5
CC.2.2.HS.C.6

Eligible Content:

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Graphs of Functions**

Time Allotment: 2 weeks **Unit Sequence: 2**

Major Concepts to be learned:

- Why rational functions have asymptotes.
- Symmetry.

Expected Skills to be demonstrated:

- Identify vertical, horizontal, and slant asymptotes, and "holes" given a rational function in algebraic form.
- Describe the end behavior of a rational or polynomial function.
- Find the inverse of a function graphically and analytically.
- Identify symmetries possessed by a function using graphical or analytical methods.
- Transform a function via translation, reflection, or dilation.

PA Standards/Anchors:

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.C.2
CC.2.2.HS.C.4

Eligible Content:

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Polynomial & Rational Functions**

Time Allotment: 2 weeks **Unit Sequence: 3**

Major Concepts to be learned:

- Why zeros of polynomial functions are important.
- The Fundamental Theorem of Algebra.

Expected Skills to be demonstrated:

- Solve a quadratic equation by factoring, completing the square, or using the quadratic formula.
- Solve rational and radical equations.
- Locate the zeros of a function by applying the Fundamental Theorem of Algebra, Complex Conjugates Theorem, Factor Theorem, and Intermediate Value Theorem.
- Use long division to divide polynomials.
- Resolve a rational expression into its partial fractions.
- Graph and perform arithmetic with imaginary numbers.

PA Standards/Anchors:

CC.2.1.HS.F.2	CC.2.2.HS.D.2	CC.2.2.HS.C.2
CC.2.1.HS.F.4	CC.2.2.HS.D.3	CC.2.2.HS.C.3
CC.2.1.HS.F.6	CC.2.2.HS.D.5	CC.2.2.HS.C.5
CC.2.1.HS.F.7	CC.2.2.HS.D.6	CC.2.2.HS.C.6
CC.2.2.HS.D.1	CC.2.2.HS.D.10	

Eligible Content:

Instructional Strategies:

Problem solving activities
Lecture
Note Taking

Assessments:

- Test

Grade: 10-12 | **Course Title: Precalculus** | **Topic/Concept: Exponential & Logarithmic Functions**

Time Allotment: 3 weeks | **Unit Sequence: 4**

Major Concepts to be learned:

- The inverse relationship between exponential and logarithmic functions.
- The difference between exponential growth and decay.

Expected Skills to be demonstrated:

- Apply properties of exponents and logarithms.
- Convert between exponential and logarithmic forms of an equation.
- Graph exponential and logarithmic functions.
- Solve exponential and logarithmic equations.
- Apply knowledge of exponential and logarithmic functions to solve problems involving exponential growth and decay.

PA Standards/Anchors:

CC.2.1.HS.F.1	CC.2.2.HS.D.8	CC.2.2.HS.C.4
CC.2.1.HS.F.4	CC.2.2.HS.D.10	CC.2.2.HS.C.5
CC.2.2.HS.D.1	CC.2.2.HS.C.2	CC.2.2.HS.C.6
CC.2.2.HS.D.2	CC.2.2.HS.C.3	

Eligible Content:

Instructional Strategies:

Problem solving activities
Lecture
Note Taking

Assessments:

- Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Triangles**

Time Allotment: 3 weeks **Unit Sequence: 5**

Major Concepts to be learned:

- The concept of radian measure.
- The relationship between the unit circle and the trigonometric functions.

Expected Skills to be demonstrated:

- Solve triangles using the trigonometric ratios, the Law of Sines or the Law of Cosines.
- Find the trigonometric function value of any special angle without the use of a calculator or table.
- Convert between radian and degree measure.
- Find the area of a triangle given SAS or SSS.
- Use formulas for arc length, sector area and segment area.
- Determine the number of possible triangles given SSA.

PA Standards/Anchors:	Eligible Content:
CC.2.1.HS.F.4 CC.2.3.HS.A.7	

Instructional Strategies:	Assessments:
• Problem solving activities • Lecture • Note Taking	• Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Trig Functions**

Time Allotment: 3 weeks **Unit Sequence: 6**

Major Concepts to be learned:

- The unit circle.

Expected Skills to be demonstrated:

- Sketch graphs for all 6 trig/reciprocal trig functions and their inverse relations given the function or its description in terms of amplitude, sinusoidal axis, phase shift, and period.
- State the domain and range for the functions/relations described above.
- Transform basic trig function graphs using linear translations and/or dilations.

PA Standards/Anchors:

CC.2.1.HS.F.4	CC.2.2.HS.D.8	CC.2.2.HS.C.3
CC.2.2.HS.D.1	CC.2.2.HS.D.10	CC.2.2.HS.C.4
CC.2.2.HS.D.2	CC.2.2.HS.C.2	CC.2.2.HS.C.6
CC.2.2.HS.C.7	CC.2.2.HS.C.8	

Eligible Content:

Instructional Strategies:

Problem solving activities
Lecture
Note Taking

Assessments:

- Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Trig Identities & Equations**

Time Allotment: 2 weeks **Unit Sequence: 7**

Major Concepts to be learned:

- Inverse trig relations produce an infinite number of solutions when used to solve an equation.

Expected Skills to be demonstrated:

- Use trigonometric identities, algebra, and inverse trig relations to solve trig equations.

PA Standards/Anchors:	Eligible Content:
CC.2.2.HS.D.1 CC.2.2.HS.D.2 CC.2.2.HS.C.9	N/A

Instructional Strategies:	Assessments:
• Problem solving activities • Lecture • Note Taking	• Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Vectors**

Time Allotment: 2 weeks **Unit Sequence: 8**

Major Concepts to be learned:

- Vectors.

Expected Skills to be demonstrated:

- Interchange between component and magnitude & direction forms of a vector.
- Add or subtract vectors.
- Multiply a vector by a scalar.
- Multiply two vectors using both dot and cross products.

PA Standards/Anchors:	Eligible Content:
N/A	N/A

Instructional Strategies:	Assessments:
• Problem solving activities • Lecture • Note Taking	• Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Counting and Probability**

Time Allotment: 3 weeks **Unit Sequence: 9**

Major Concepts to be learned:

- Probability.
- The counting principle.

Expected Skills to be demonstrated:

- Select and apply appropriate counting techniques (counting principle, combinations, permutations) given a scenario.
- Calculate probability/odds using counting techniques and other probability principles (counting principle for probability; conditional probability; “and,” “or,” “then” probabilities; binomial experiments).

PA Standards/Anchors:	Eligible Content:

Instructional Strategies:	Assessments:
• Problem solving activities • Lecture • Note Taking	• Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Conic Sections**

Time Allotment: 2 weeks **Unit Sequence: 10**

Major Concepts to be learned:

- Eccentricity of conic sections.
- Graphing conic sections.
- Algebraic recognition of conic sections.

Expected Skills to be demonstrated:

- Identify a second degree equation as either a parabola, circle, ellipse, or hyperbola.
- Convert a conic section between general and standard forms.
- Graph a conic section.
- Write the equation for a conic section given its graph.

PA Standards/Anchors:

CC.2.2.HS.D.1
CC.2.2.HS.D.2
CC.2.2.HS.D.5
CC.2.2.HS.C.2
CC.2.3.HS.A.10

Eligible Content:

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test

Grade: 10-12 **Course Title: Precalculus** **Topic/Concept: Intro to Calculus**

Time Allotment: 8 weeks **Unit Sequence: 11**

Major Concepts to be learned:

- Limits
- Derivatives
- Indefinite Integrals
- Defininte Integrals

Expected Skills to be demonstrated:

- Evaluate limits graphically and algebraically.
- Find derivatives of polynomial and power functions using the definition of the derivative.
- Find derivatives of polynomial, power, and trig functions using the power, product, quotient and chain rules as well as the properties of derivatives.
- Find general and particular antiderivatives using the power rule and change of variables.
- Evaluate definite integrals numerically and using the Fundamental Theorem of Calculus.
- Apply derivatives and integrals to motion, area, and volume problems.

PA Standards/Anchors:

CC.2.1.HS.F.4
CC.2.2.HS.D.1
CC.2.2.HS.D.2

Eligible Content:

Instructional Strategies:

- Problem solving activities
- Lecture
- Note Taking

Assessments:

- Test