

Precalculus

- Number and Quantity** **N**
- 1 Apply properties of complex numbers and the complex number system.** **PC.N.1.**
 - 1 Execute the sum and difference algorithms to combine complex numbers. **PC.N.1.1**
 - 2 Execute the multiplication algorithm with complex numbers. **PC.N.1.2**

 - 2 Apply properties and operations with matrices.** **PC.N.2**
 - 1 Execute the sum and difference algorithms to combine matrices of appropriate dimensions. **PC.N.2.1**
 - 2 Execute associative and distributive properties to matrices. **PC.N.2.2**
 - 3 Execute commutative property to add matrices. **PC.N.2.3**
 - 4 Execute properties of matrices to multiply a matrix by a scalar. **PC.N.2.4**
 - 5 Execute the multiplication algorithm with matrices. **PC.N.2.5**

 - 3 Understand properties and operations with vectors.** **PC.N.3**
 - 1 Represent a vector indicating magnitude and direction. **PC.N.3.1**
 - 2 Execute sum and difference algorithms to combine vectors. **PC.N.3.2**

- Algebra** **A**
- 1 Apply properties of solving inequalities that include rational and polynomial expressions in one variable.** **PC.A.1**
 - 1 Implement algebraic (sign analysis) methods to solve rational and polynomial inequalities. **PC.A.1.1**
 - 2 Implement graphical methods to solve rational and polynomial inequalities. **PC.A.1.2**

2 Apply properties of solving equations involving exponential, logarithmic, and trigonometric functions. PC.A.2

- 1 Use properties of logarithms to rewrite expressions. PC.A.2.1
- 2 Implement properties of exponentials and logarithms to solve equations. PC.A.2.2
- 3 Implement properties of trigonometric functions to solve equations including PC.A.2.3
 - a inverse trigonometric functions PC.A.2.3A
 - b double angle formulas PC.A.2.3B
 - c Pythagorean identities. PC.A.2.3C
- 4 Implement algebraic techniques to rewrite parametric equations in cartesian form by eliminating the parameter. PC.A.2.4

Functions

1 Understand key features of sine, cosine, tangent, cotangent, secant and cosecant functions. PC.F.1

- 1 Interpret algebraic and graphical representations to determine key features of transformed sine and cosine functions. Key features include: amplitude, domain, midline, phase shift, frequency, period, intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums. PC.F.1.1
- 2 Interpret algebraic and graphical representations to determine key features of tangent, cotangent, secant, and cosecant. Key features include: domain, frequency, period, intervals where the function is increasing, decreasing, positive or negative, relative maximums and minimums, and asymptotes. PC.F.1.2
- 3 Integrate information to build trigonometric functions with specified amplitude, frequency, period, phase shift, or midline with or without context. PC.F.1.3
- 4 Implement graphical and algebraic methods to solve trigonometric equations and inequalities in context with support from technology. PC.F.1.4

2 Apply properties of a unit circle with center (0,0) to determine the values of sine, cosine, tangent, cotangent, secant, and cosecant. PC.F.2

- 1 Use a unit circle to find values of sine, cosine, and tangent for angles in terms of reference angles. PC.F.2.1
- 2 Explain the relationship between the symmetry of a unit circle and the periodicity of trigonometric functions. PC.F.2.2

3 Apply properties of trigonometry to solve problems involving all types of triangles. PC.F.3

- 1 Implement a strategy to solve equations using inverse trigonometric functions. PC.F.3.1
- 2 Implement the Law of Sines and the Law of Cosines to solve problems. PC.F.3.2
- 3 Implement the Pythagorean identity to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle. PC.F.3.3

4 Understand the relationship of algebraic and graphical representations of exponential, logarithmic, rational, power functions, and conic sections to their key features. PC.F.4

- 1 Interpret algebraic and graphical representations to determine key features of exponential functions. Key features include: domain, range, intercepts, intervals where the function is increasing, decreasing, positive or negative, concavity, end behavior, limits, and asymptotes. PC.F.4.1
- 2 Integrate information to build exponential functions to model phenomena involving growth or decay. PC.F.4.2
- 3 Interpret algebraic and graphical representations to determine key features of logarithmic functions. Key features include: domain, range, intercepts, intervals where the function is increasing, decreasing, positive or negative, concavity, end behavior, continuity, limits, and asymptotes. PC.F.4.3
- 4 Implement graphical and algebraic methods to solve exponential and logarithmic equations in context with support from technology. PC.F.4.4
- 5 PC.F.4.5 Interpret algebraic and graphical representations to determine key features of rational functions. Key features include: domain, range, intercepts, intervals where the function is increasing, decreasing, positive or negative, concavity, end behavior, continuity, limits, and asymptotes. PC.F.4.5
- 6 Implement graphical and algebraic methods to solve optimization problems given rational and polynomial functions in context with support from technology. PC.F.4.6
- 7 Construct graphs of transformations of power, exponential, and logarithmic functions showing key features. PC.F.4.7
- 8 Identify the conic section (ellipse, hyperbola, parabola) from its algebraic representation in standard form. PC.F.4.8
- 9 Interpret algebraic and graphical representations to determine key features of conic sections (ellipse: center, length of the major and minor axes; hyperbola: vertices, transverse axis; parabola: vertex, axis of symmetry). PC.F.4.9

5 Apply properties of function composition to build new functions from existing functions. PC.F.5

- 1 Implement algebraic procedures to compose functions. PC.F.5.1
- 2 Execute a procedure to determine the value of a composite function at a given value using algebraic, graphical, and tabular representations. PC.F.5.2
- 3 Implement algebraic methods to find the domain of a composite function. PC.F.5.3
- 4 Organize information to build models involving function composition. PC.F.5.4
- 5 Deconstruct a composite function into two functions. PC.F.5.5
- 6 Implement algebraic and graphical methods to find an inverse function of an existing function, restricting domains if necessary. PC.F.5.6
- 7 Use composition to determine if one function is the inverse of another function. PC.F.5.7

6 Apply mathematical reasoning to build recursive functions to model and solve problems. PC.F.6

- 1 Use algebraic representations to build recursive functions. PC.F.6.1
- 2 Construct a recursive function for a sequence represented numerically. PC.F.6.2

7 Apply mathematical reasoning to build parametric functions and solve problems. PC.F.7

- 1 Implement algebraic methods to write parametric equations in context. PC.F.7.1
- 2 Implement technology to solve contextual problems involving parametric equations. PC.F.7.2