North Carolina Mathematics

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(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) 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