South Dakota Mathematics

Pre-Calculus

Functions & Relationships

Operations and Graphing

1. Add, subtract, multiply, and divide polynomial and rational functions. PC.FR.1
2. Use the properties of exponents to find equivalent expressions and to solve equations. PC.FR.2
3. Use properties of logarithms to simplify and evaluate logarithmic expressions, and to solve equations. PC.FR.3
4. Find the composition of two functions and determine the domain of the composite function PC.FR.4
5. Determine if a function has an inverse and find the inverse of a function algebraically and graphically, restricting the domain if necessary. PC.FR.5
6. Analyze functions and identify key features including domain, range, intercepts, symmetry, asymptotes, and end behavior. PC.FR.6
7. Apply transformations (translations, reflections, and dilations) to functions and graphs of polynomial, rational, exponential, and logarithmic functions. PC.FR.7
8. Model data sets with exponential and logarithmic regression. PC.FR.8
9. Choose an appropriate regression model and use it to make predictions. PC.FR.9

Trigonometry

Trigonometric Functions and Equations

1. Use trigonometric functions to model and solve real-world problems PC.TF.1
2. Develop the Pythagorean and Quotient Identities, and use them to simplify expressions and solve equations PC.TF.2
3. Use the addition and subtraction, half-angle, and double-angle formulas for sine, cosine, and tangent to simplify expressions and solve equations. PC.TF.3
4. Apply the Law of Sines (including the ambiguous case) and the Law of Cosines to find unknown sides and angles in any triangle. PC.TF.4

Graphs and Key Features

5. Explain how changes in amplitude, period, phase shift, and midline affect the graph of sine, cosine, and tangent functions, using transformations and real-world contexts to support understanding. PC.TF.5
6. Explain how changes in amplitude, period, phase shift, and midline affect the graph of secant, cosecant, and cotangent functions, using transformations. PC.TF.6

Unit Circle and Applications

7. Explain the relationship between the radian measure of an angle and the length of the arc it subtends on a unit circle. PC.TF.7
8. Explain how the unit circle can be used to model sine, cosine, tangent, secant, cosecant, and cotangent for all real numbers. PC.TF.8
9. Calculate arc length, area of a sector, linear speed, and angular speed in real-world contexts. PC.TF.9

Polar & Parametric

Coordinates and Equations

1. Represent points and equations in both rectangular and polar coordinate systems and convert between them. PC.PP.1
2. Represent and graph parametric equations and eliminate the parameter to convert to rectangular form. PC.PP.2
3. Represent complex numbers in rectangular and polar form and multiply, divide, and evaluate powers (De Moivre's Theorem). PC.PP.3
4. Find the modulus of a complex number, and the distance between two complex numbers PC.PP.4

Vectors & Matrices

Vector Operations and Applications

1. Represent vectors in component form and calculate magnitude and direction. PC.VM.1
2. Perform vector addition, subtraction, and scalar multiplication both visually and component-wise. PC.VM.2

Matrices and Systems

3. Find the dot product of, and angle between, two vectors. PC.VM.3
4. Use matrices to represent and solve systems of equations, in two and three variables, with and without technology PC.VM.4
5. Perform matrix multiplication and use matrices to represent transformations in the plane. PC.VM.5
6. Find the determinant and inverse of a matrix, with and without technology. PC.VM.6

Conic Sections

Properties, Equations and Graphs

1. Identify and describe the properties of conic sections (parabolas, ellipses, circles, and hyperbolas). PC.CS.1
2. Write equations and graph conic sections given specific properties, features, or transformations. PC.CS.2

Sequences & Series

Patterns and Sums

1. Define and use arithmetic and geometric sequences and series to model real-world situations. PC.SS.1
2. Find partial sums of arithmetic and geometric series and understand the concept of limits as they relate to infinite series. PC.SS.2
3. Know and apply the Binomial Theorem. PC.SS.3