

# 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](#)
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## 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](#)
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### 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](#)

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## 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](#)
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## 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](#)
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## 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](#)
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### 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](#)
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## 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](#)
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## 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](#)