

# Precalculus: Algebra: Grades 9, 10, 11, 12

Adopted 2020

## Process Standards For Mathematics

1. Make sense of problems and persevere in solving them. [PS.1](#)

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2. Reason abstractly and quantitatively. [PS.2](#)

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3. Construct viable arguments and critique the reasoning of others. [PS.3](#)

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4. Model with mathematics. [PS.4](#)

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5. Use appropriate tools strategically. [PS.5](#)

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6. Attend to precision. [PS.6](#)

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7. Look for and make use of structure. [PS.7](#)

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8. Look for and express regularity in repeated reasoning. [PS.8](#)

## Functions

1. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. [PC.F.1](#)

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2. Find linear models by using median fit and least squares regression methods, making use of technology. Decide which among several linear models gives a better fit. Interpret the slope and intercept in terms of the original context. [PC.F.2](#)

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3. Compose functions and find the domain of composite functions. [PC.F.3](#)

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4. Determine if a graph or table has an inverse, and justify if the inverse is a function, relation, or neither. Identify the values of an inverse function/relation from a graph or a table, given that the function has an inverse. Derive the inverse equation from the values of the inverse. [PC.F.4](#)

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5. Produce an invertible function from a non-invertible function by restricting the domain. [PC.F.5](#)

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**6. Recognize even and odd functions from their graphs and algebraic expressions.** [PC.F.6](#)

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**Quadratic, Polynomial and Rational Equations and Functions**

**1. Use the method of completing the square to transform any quadratic equation into an equation of the form  $(x - p)^2 = q$  that has the same solutions. Derive the quadratic formula from this form.** [PC.QPR.1](#)

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**2. Understand and use addition, subtraction, multiplication, and conjugation of complex numbers.** [PC.QPR.2](#)

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**3. Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.** [PC.QPR.3](#)

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**4. Know and apply the Remainder Theorem and the Factor Theorem.** [PC.QPR.4](#)

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**5. Understand the Fundamental Theorem of Algebra. Find a polynomial function of lowest degree with real coefficients when given its roots.** [PC.QPR.5](#)

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**6. Graph rational functions with and without technology. Identify and describe features such as intercepts, domain and range, and asymptotic and end behavior.** [PC.QPR.6](#)

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**Exponential and Logarithmic Functions**

**1. Use the definition of logarithms to convert logarithms from one base to another and prove simple laws of logarithms.** [PC.EL.1](#)

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**2. Use the laws of logarithms to simplify logarithmic expressions, approximate the value of a logarithmic expression, and solve logarithmic equations.** [PC.EL.2](#)

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**3. Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic functions; interpret the solution and determine whether it is reasonable. Identify and describe features such as intercepts, domain, range, asymptotes, and end behavior.** [PC.EL.3](#)

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**4. Use technology to find a quadratic, exponential, logarithmic, or power function that models a relationship for a bivariate data set to make predictions.** [PC.EL.4](#)

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**Sequences and Series**

**1. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.** [PC.SS.1](#)

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**2. Write arithmetic and geometric sequences both recursively and with an explicit formula; use them to model situations and translate between the two forms.** [PC.SS.2](#)

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**3. Find partial sums of arithmetic and geometric series and represent them using sigma notation.** [PC.SS.3](#)

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- 4. Model and solve real-world problems involving applications of sequences and series, interpret the solutions and determine whether the solutions are reasonable.** *PC.SS.4*
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## Conics

- 1. Construct the equation of a parabola given a focus and directrix.** *PC.CO.1*
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- 2. Construct the equation of a circle of given center and radius. Complete the square to find the center and radius of a circle given by an equation.** *PC.CO.2*
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- 3. Construct the equations of ellipses and hyperbolas given at least 2 of the following: foci, vertices, length of an axis, or point on the curve.** *PC.CO.3*
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- 4. Graph conic sections. Identify and describe features like center, vertex or vertices, focus or foci, directrix, axis of symmetry, major axis, minor axis, and eccentricity.** *PC.CO.4*