Indiana Mathematics

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
2. **Reason abstractly and quantitatively.** PS.2
3. **Construct viable arguments and critique the reasoning of others.** PS.3
4. **Model with mathematics.** PS.4
5. **Use appropriate tools strategically.** PS.5
6. **Attend to precision.** PS.6
7. **Look for and make use of structure.** PS.7
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
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
3. **Compose functions and find the domain of composite functions.** PC.F.3
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
5. **Produce an invertible function from a non-invertible function by restricting the domain.** PC.F.5

Skip to main content

	6. Recognize even and odd functions from their graphs and algebraic expressions. PC.F.6
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
	2. Understand and use addition, subtraction, multiplication, and conjugation of complex numbers. PC.QPR.2
	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
	4. Know and apply the Remainder Theorem and the Factor Theorem. PC.QPR.4
	5. Understand the Fundamental Theorem of Algebra. Find a polynomial function of lowest degree with real coefficients when given its roots. PC.QPR.5
	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
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
	2. Use the laws of logarithms to simplify logarithmic expressions, approximate the value of a logarithmic expression, and solve logarithmic equations. PC.EL.2
	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
	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
Sequences and Series	1. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. PC.SS.1
	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
	3. Find partial sums of arithmetic and geometric series and represent them using sigma notation. PC.SS.3
	Model and solve real-world problems involving applications of sequences and series, interpret the solutions and determine whether the solutions are

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reasonable. PC.SS.4

Conics

1. **Construct the equation of a parabola given a focus and directrix.** PC.CO.1
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
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
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