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DEPARTMENT OF EDUCATION

Working Together for Student Success



Indiana Academic Standards Precalculus: Algebra Crosswalk

2014 Standard Language	2020 Standard Language	Suggested Changes
Precalculus: Algebra		
Polar Coordinates and Complex Numbers - REMOVED CLUSTER		
PC.PCN.1: 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.		Removed standard Moved to 2020 PC.QPR.3 No language change
PC.PCN.2: Understand and use complex numbers, including real and imaginary numbers, on the complex plane in rectangular and polar form, and explain why the rectangular and polar forms of a given complex number represent the same number.		Removed standard Moved to 2020 TR.PC.1 No language change
PC.PCN.3: Understand and use addition, subtraction, multiplication, and conjugation of complex numbers, including real and imaginary numbers, on the complex plane in rectangular and polar form.		Removed standard Moved to 2020 PC.QPR.2 Language change Removed “ including real and imaginary numbers, on the complex plane in rectangular and polar form” .
PC.PCN.4: State, prove, and use DeMoivre’s Theorem.		Removed standard Moved to 2020 TR.PC.2

		No language change
Functions		
PC.F.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: 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.	No change
PC.F.2: Find linear models by using median fit and least squares regression methods. Decide which among several linear models gives a better fit. Interpret the slope and intercept in terms of the original context.	PC.F.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.	Language change Added “making use of technology”.
PC.F.3: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.		Removed Standard Moved to 2020 PC.SS.1 No language change
	PC.F.3: Compose functions and find the domain of composite functions.	New Standard

<p>PC.F.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.</p>	<p>PC.F.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.</p>	<p>No change</p>
<p>PC.F.5: Produce an invertible function from a non-invertible function by restricting the domain.</p>	<p>PC.F.5: Produce an invertible function from a non-invertible function by restricting the domain.</p>	<p>No change</p>
<p>PC.F.6: Describe the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative). Find the value of k given the graph $f(x)$ and the graph of $f(x) + k$, $k f(x)$, $f(kx)$, or $f(x + k)$. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Recognize even and odd functions from their graphs and algebraic expressions.</p>	<p>PC.F.6: Recognize even and odd functions from their graphs and algebraic expressions.</p>	<p>Language change</p> <p>Removed “Describe the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative). Find the value of k given the graph $f(x)$ and the graph of $f(x) + k$, $k f(x)$, $f(kx)$, or $f(x + k)$. Experiment with cases and illustrate an explanation of the effects on the graph using technology.”</p>
<p>PC.F.7: Decide if a function is continuous at a point. Find the types of discontinuities of a function and relate them to finding limits of a function. Use</p>		<p>Removed standard</p>

the concept of limits to describe discontinuity and end-behavior of the function.		
PC.F.8: Define arithmetic and geometric sequences recursively. Use a variety of recursion equations to describe a function. Model and solve word problems involving applications of sequences and series, interpret the solutions and determine whether the solutions are reasonable.		Removed standard
PC.F.9: Use iteration and recursion as tools to represent, analyze, and solve problems involving sequential change.		Removed standard
PC.F.10: Describe the concept of the limit of a sequence and a limit of a function. Decide whether simple sequences converge or diverge. Recognize an infinite series as the limit of a sequence of partial sums.		Removed standard
Quadratic, Polynomial, and Rational Equations and Functions		
PC.QPR.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: 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.	No change

	PC.QPR.2: Understand and use addition, subtraction, multiplication, and conjugation of complex numbers.	<p>New standard</p> <p>Moved from 2014 PC.PCN.3</p> <p>Language change</p> <p>Removed “ including real and imaginary numbers, on the complex plane in rectangular and polar form” .</p>
PC.QPR.2: 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: Graph rational functions with and without technology. Identify and describe features such as intercepts, domain and range, and asymptotic and end behavior.	<p>Indicator change</p> <p>No language change</p>
	PC.QPR.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.	<p>New standard</p> <p>Moved from 2014 PC.PCN.1</p> <p>No language change</p>
PC.QPR.3: Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a , the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	PC.QPR.4: Know and apply the Remainder Theorem and the Factor Theorem.	<p>Indicator change</p> <p>Language change</p> <p>Added “Factor Theorem”</p> <p>Removed “For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x$</p>

		– a) is a factor of $p(x)$ ”
PC.QPR.4: Understand the Fundamental Theorem of Algebra. Find a polynomial function of lowest degree with real coefficients when given its roots.	PC.QPR.5: Understand the Fundamental Theorem of Algebra. Find a polynomial function of lowest degree with real coefficients when given its roots.	Indicator change No language change
Exponential and Logarithmic Functions and Equations		
PC.EL.1: Use the definition of logarithms to convert logarithms from one base to another and prove simple laws of logarithms.	PC.EL.1: Use the definition of logarithms to convert logarithms from one base to another and prove simple laws of logarithms.	No change
PC.EL.2: Use the laws of logarithms to simplify logarithmic expressions and find their approximate values.	PC.EL.2: Use the laws of logarithms to simplify logarithmic expressions, approximate the value of a logarithmic expression, and solve logarithmic equations.	Language change Added “and solve logarithmic equations”
PC.EL.3: Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic equations and inequalities; interpret the solution and determine whether it is reasonable.	PC.EL.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	Language change Changed “equations and inequalities; interpret the solution and determine whether it is reasonable” to “ 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.4: Use technology to find a quadratic, exponential,	PC.EL.4: Use technology to find a quadratic, exponential,	Language change

<p>logarithmic, or power function that models a relationship for a bivariate data set to make predictions; compute (using technology) and interpret the correlation coefficient.</p>	<p>logarithmic, or power function that models a relationship for a bivariate data set to make predictions.</p>	<p>Removed “compute (using technology) and interpret the correlation coefficient”.</p>
<p>Sequences and Series - NEW CLUSTER</p>		
	<p>PC.SS.1: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.</p>	<p>New standard Moved from 2014 PC.F.3 No language change</p>
	<p>PC.SS.2: Write arithmetic and geometric sequences both recursively and with an explicit formula; use them to model situations and translate between the two forms.</p>	<p>New standard Moved from 2014 All.EL.1 No language change</p>
	<p>PC.SS.3: Find partial sums of arithmetic and geometric series and represent them using sigma notation.</p>	<p>New standard Moved from 2014 All.CNE.6 No language change</p>
	<p>PC.SS.4: Model and solve real-world problems involving applications of sequences and series, interpret the solutions and determine whether the solutions are reasonable.</p>	<p>New standard Adapted from previous PC.F.8</p>
<p>Conics - NEW CLUSTER - ADAPTED AND MOVED FROM TRIGONOMETRY</p>		
	<p>PC.CO.1: Construct the</p>	<p>New standard</p>

	<p>equation of a parabola given a focus and directrix.</p>	<p>Moved from 2014 TR.CO.2</p> <p>Language change</p> <p>Changed “Derive” to “Construct”</p>
	<p>PC.CO.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.</p>	<p>New standard</p> <p>Moved from 2014 TR.CO.3</p> <p>Language change</p> <p>Changed “Derive” to “Construct”</p> <p>Removed “using Pythagorean Theorem”</p>
	<p>PC.CO.3: Construct the equations of ellipses and hyperbolas given at least two of the following: foci, vertices, length of an axis, or point on the curve.</p>	<p>New standard</p> <p>Moved from 2014 TR.CO.4</p> <p>Language change</p> <p>Added “ given at least 2 of the following: foci, vertices, length of an axis, or point on the curve”.</p> <p>Removed “using the fact that the sum or difference of distances from the foci is constant”.</p> <p>Changed “Derive” to “Construct”</p>

	<p>PC.CO.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.</p>	<p>New standard Moved from 2014 TR.CO.5 No language change</p>
<p>Parametric Equations - REMOVED CLUSTER</p>		
<p>PC.PE.1: Convert between a pair of parametric equations and an equation in x and y. Model and solve problems using parametric equations.</p>		<p>Removed standard</p>
<p>PC.PE.2: Analyze planar curves, including those given in parametric form.</p>		<p>Removed standard</p>