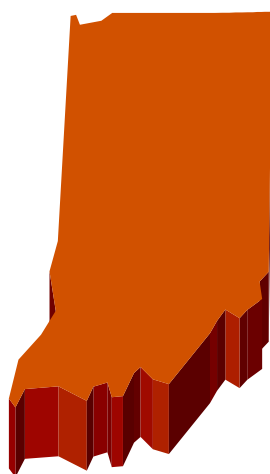
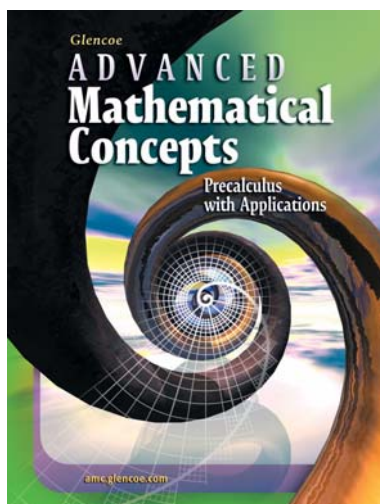


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alignment to

**Indiana
Academic Mathematics Standards
Pre-Calculus**

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**INDIANA
ACADEMIC MATHEMATICS STANDARDS FOR PRE-CALCULUS**

OBJECTIVES		PAGE REFERENCES	
Relations and Functions			
Students use polynomial, rational, and algebraic functions to write functions and draw graphs to solve word problems, to find composite and inverse functions, and to analyze functions and graphs. They analyze and graph circles, ellipses, parabolas, and hyperbolas.			
PC.1.1	Recognize and graph various types of functions, including polynomial, rational, algebraic, and absolute value functions. Use paper and pencil methods and graphing calculators.	PE:	11, 47–48, 49, 56, 60, 137, 142–149, 151, 182, 186–187, 198–199, 200, 206, 210–211, 221, 242, 258–262
		TWE:	11, 47–48, 49, 56, 60, 137, 142–149, 151, 182, 186–187, 198–199, 200, 206, 210–211, 221, 242, 258–262
PC.1.2	Find domain, range, intercepts, zeros, poles, asymptotes, and points of discontinuity of functions. Use paper and pencil methods and graphing calculators.	PE:	5–6, 14–16, 19, 22–23, 24–25, 30, 48, 72, 86, 108, 111, 157, 159–160, 165–166, 169, 184–185, 186–187, 200, 206, 232
		TWE:	5–6, 14–16, 19, 22–23, 24–25, 30, 48, 72, 86, 108, 111, 157, 159–160, 165–166, 169, 184–185, 186–187, 200, 206, 232
PC.1.3	Model and solve word problems using functions and equations.	PE:	31, 38–40, 61, 67, 69–70, 78–79, 96, 98–101, 123, 127–132, 151, 201, 205, 209, 258, 260–261, 271
		TWE:	31, 38–40, 61, 67, 69–70, 78–79, 96, 98–101, 123, 127–132, 151, 201, 205, 209, 258, 260–261, 271
PC.1.4	Define, find, and check inverse functions.	PE:	152, 153, 154, 155, 156, 191–192, 221, 718, 729
		TWE:	152, 153, 154, 155, 156, 191–192, 221, 718, 729
PC.1.5	Describe the symmetry of the graph of a function.	PE:	127–133, 134–135, 137, 145, 167, 198, 201
		TWE:	127–133, 134–135, 137, 145, 167, 198, 201

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OBJECTIVES		PAGE REFERENCES	
PC.1.6	Decide if functions are even or odd.	PE:	133, 145, 163, 166, 197, 732
		TWE:	133, 145, 163, 166, 197, 732
PC.1.7	Apply transformations to functions.	PE:	137–141, 142–145, 149, 182, 185, 186, 198, 200, 201, 709
		TWE:	137–141, 142–145, 149, 182, 185, 186, 198, 200, 201, 709
PC.1.8	Understand curves defined parametrically and draw their graphs.	PE:	520–524, 526–530, 531–533, 542, 546, 663–669, 684, 690
		TWE:	520–524, 526–530, 531–533, 542, 546, 663–669, 684, 690
PC.1.9	Compare relative magnitudes of functions and their rates of change.	PE:	21–22, 27–30, 41, 56, 171–175, 176, 177–179, 199, 201, 212, 225
		TWE:	21–22, 27–30, 41, 56, 171–175, 176, 177–179, 199, 201, 212, 225
PC.1.10	Write the equations of conic sections in standard form (completing the square and using translations as necessary), in order to find the type of conic section and to find its geometric properties (foci, asymptotes, eccentricity, etc.).	PE:	624–626, 627, 628–630, 633–634, 636–637, 638–641, 642–649, 650–652, 660, 662–665, 667, 691
		TWE:	624–626, 627, 628–630, 633–634, 636–637, 638–641, 642–649, 650–652, 660, 662–665, 667, 691
Logarithmic and Exponential Functions			
Students solve word problems involving logarithmic and exponential functions. They draw and analyze graphs, and find inverse functions.			
PC.2.1	Solve word problems involving applications of logarithmic and exponential functions.	PE:	704–708, 709–711, 718, 720, 723, 727–728, 729, 737, 740–744, 745–748, 753
		TWE:	704–708, 709–711, 718, 720, 723, 727–728, 729, 737, 740–744, 745–748, 753

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OBJECTIVES		PAGE REFERENCES	
PC.2.2	Find the domain, range, intercepts, and asymptotes of logarithmic and exponential functions.	PE:	704–708, 709–711, 717, 718–722, 723–725
		TWE:	704–708, 709–711, 717, 718–722, 723–725
PC.2.3	Draw and analyze graphs of logarithmic and exponential functions.	PE:	704–708, 709–711, 717, 718, 721, 722, 723–725, 729, 730–732, 733–735, 736–737, 740–744, 745–748, 750–753
		TWE:	704–708, 709–711, 717, 718, 721, 722, 723–725, 729, 730–732, 733–735, 736–737, 740–744, 745–748, 750–753
PC.2.4	Define, find, and check inverse functions of logarithmic and exponential functions.	PE:	718–721, 729
		TWE:	718–721, 729
Trigonometry in Triangles			
Students define trigonometric functions using right triangles. They solve word problems and apply the laws of sines and cosines.			
PC.3.1	Solve word problems involving right and oblique triangles.	PE:	307, 309–311, 316, 328, 330–331, 339, 350–351, 429, 481, 511, 533
		TWE:	307, 309–311, 316, 328, 330–331, 339, 350–351, 429, 481, 511, 533
PC.3.2	Apply the laws of sines and cosines to solving problems.	PE:	313–316, 317–318, 320–323, 324–326, 327–330, 331–332, 336–339, 436, 437, 516, 557
		TWE:	313–316, 317–318, 320–323, 324–326, 327–330, 331–332, 336–339, 436, 437, 516, 557
PC.3.3	Find the area of a triangle given two sides and the angle between them.	PE:	307, 314–316, 328, 337, 338, 339, 376, 461, 548–549, 613
		TWE:	307, 314–316, 328, 337, 338, 339, 376, 461, 548–549, 613

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OBJECTIVES		PAGE REFERENCES	
Trigonometric Functions			
Students define trigonometric functions using the unit circle and use degrees and radians. They draw and analyze graphs, find inverse functions, and solve word problems.			
PC.4.1	Define sine and cosine using the unit circle.	PE:	291–292, 294–295, 296–298, 335, 422, 429, 458
		TWE:	291–292, 294–295, 296–298, 335, 422, 429, 458
PC.4.2	Convert between degree and radian measures.	PE:	343–344, 345–347, 348–351, 414, 417
		TWE:	343–344, 345–347, 348–351, 414, 417
PC.4.3	Learn exact sine, cosine, and tangent values for $0, \frac{\pi}{2}, \frac{\pi}{3}, \frac{\pi}{4}, \frac{\pi}{6}$, and multiples of π . Use those values to find other trigonometric values.	PE:	285–289, 343–344, 345–347, 348–351, 395–400, 401–403, 414, 417
		TWE:	285–289, 343–344, 345–347, 348–351, 395–400, 401–403, 414, 417
PC.4.4	Solve word problems involving applications of trigonometric functions.	PE:	292–293, 294–296, 297–298, 299–301, 302–304, 318, 336–339, 383, 384–386, 425, 427, 428–429
		TWE:	292–293, 294–296, 297–298, 299–301, 302–304, 318, 336–339, 383, 384–386, 425, 427, 428–429
PC.4.5	Define and graph trigonometric functions (i.e., sine, cosine, tangent, cosecant, secant, cotangent).	PE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 401–403, 416
		TWE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 401–403, 416

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OBJECTIVES		PAGE REFERENCES	
PC.4.6	Find domain, range, intercepts, periods, amplitudes, and asymptotes of trigonometric functions.	PE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 401–403, 415, 416
		TWE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 401–403, 415, 416
PC.4.7	Draw and analyze graphs of translations of trigonometric functions, including period, amplitude, and phase shift.	PE:	378–380, 381–383, 384–386, 389, 391, 394, 396–400, 401–403, 404, 415, 416, 417, 446, 912
		TWE:	378–380, 381–383, 384–386, 389, 391, 394, 396–400, 401–403, 404, 415, 416, 417, 446, 912
PC.4.8	Define and graph inverse trigonometric functions.	PE:	306, 405–409, 410–412, 416
		TWE:	306, 405–409, 410–412, 416
PC.4.9	Find values of trigonometric and inverse trigonometric functions.	PE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 405–409, 410–412, 416, 425, 434–436, 702
		TWE:	291–296, 297–298, 299–301, 302–304, 359–362, 363–366, 368–372, 373–377, 378–382, 383–386, 387–391, 392–394, 395–400, 405–409, 410–412, 416, 425, 434–436, 702
PC.4.10	Know that the tangent of the angle that a line makes with the x-axis is equal to the slope of the line.	PE:	293–295, 395–403, 406
		TWE:	293–295, 395–403, 406

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OBJECTIVES	PAGE REFERENCES
PC.4.11 Make connections between right triangle ratios, trigonometric functions, and circular functions.	PE: 284–287, 288–290, 291, 292, 293, 295, 296–298, 300–301, 304, 422–426, 429 TWE: 284–287, 288–290, 291, 292, 293, 295, 296–298, 300–301, 304, 422–426, 429
Trigonometric Identities and Equations	
Students prove trigonometric identities, solve trigonometric equations, and solve word problems.	
PC.5.1 Know the basic trigonometric identity $\cos 2x + \sin 2x = 1$ and prove that it is equivalent to the Pythagorean Theorem.	PE: 421–423, 426, 427–430, 432, 433, 434–436, 440, 457, 478 TWE: 421–423, 426, 427–430, 432, 433, 434–436, 440, 457, 478
PC.5.2 Use basic trigonometric identities to verify other identities and simplify expressions.	PE: 421–426, 427–430, 431–433, 434–436, 437–441, 443–445, 446–447, 448–453, 454–455, 456–458, 459–461, 478–481 TWE: 421–426, 427–430, 431–433, 434–436, 437–441, 443–445, 446–447, 448–453, 454–455, 456–458, 459–461, 478–481
PC.5.3 Understand and use the addition formulas for sines, cosines, and tangents.	PE: 438, 439, 441, 442–445, 448–449, 453–455, 477, 478–481, 498 TWE: 438, 439, 441, 442–445, 448–449, 453–455, 477, 478–481, 498
PC.5.4 Understand and use the half-angle and double-angle formulas for sines, cosines, and tangents.	PE: 448–453, 454–455, 476, 477, 479, 481 TWE: 448–453, 454–455, 476, 477, 479, 481
PC.5.5 Solve trigonometric equations.	PE: 456–458, 459–461, 477–481, 482–483 TWE: 456–458, 459–461, 477–481, 482–483
PC.5.6 Solve word problems involving applications of trigonometric equations.	PE: 456–458, 459–461, 477–481, 482–483 TWE: 456–458, 459–461, 477–481, 482–483

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OBJECTIVES		PAGE REFERENCES	
Polar Coordinates and Complex Numbers			
Students define polar coordinates and complex numbers and understand their connection with trigonometric functions			
PC.6.1	Define polar coordinates and relate polar coordinates to Cartesian coordinates.	PE:	553–557, 558–560, 568–571, 572–573, 607, 611
		TWE:	553–557, 558–560, 568–571, 572–573, 607, 611
PC.6.2	Represent equations given in rectangular coordinates in terms of polar coordinates.	PE:	568–571, 574–577, 578–579, 609–610
		TWE:	568–571, 574–577, 578–579, 609–610
PC.6.3	Graph equations in the polar coordinate plane.	PE:	561–564, 565–567, 576–577, 608
		TWE:	561–564, 565–567, 576–577, 608
PC.6.4	Define complex numbers, convert complex numbers to trigonometric form, and multiply complex numbers in trigonometric form.	PE:	580–582, 583–585, 586–589, 590–591, 593–596, 597–598, 609, 610, 611
		TWE:	580–582, 583–585, 586–589, 590–591, 593–596, 597–598, 609, 610, 611
PC.6.5	State, prove, and use De Moivre’s Theorem.	PE:	599–601, 603–604, 605–606, 610, 827
		TWE:	599–601, 603–604, 605–606, 610, 827
Sequences and Series			
Students define and use arithmetic and geometric sequences and series, understand the concept of a limit, and solve word problems.			
PC.7.1	Understand and use summation notation.	PE:	769, 779, 781, 794–797, 798–800, 829, 831
		TWE:	769, 779, 781, 794–797, 798–800, 829, 831
PC.7.2	Find sums of infinite geometric series.	PE:	769–770, 774–780, 781–783, 794–796, 831
		TWE:	769–770, 774–780, 781–783, 794–796, 831

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OBJECTIVES		PAGE REFERENCES	
PC.7.3	Prove the sum formulas for arithmetic series and for finite and infinite geometric series.	PE:	759–762, 763–765, 769–770, 771–773, 774–780, 781–783, 794–797, 798–800, 801–804, 805, 829–833
		TWE:	759–762, 763–765, 769–770, 771–773, 774–780, 781–783, 794–797, 798–800, 801–804, 805, 829–833
PC.7.4	Use recursion to describe a sequence.	PE:	760, 763–765, 829
		TWE:	760, 763–765, 829
PC.7.5	Understand and use the concept of limit of a sequence or function as the independent variable approaches infinity or a number. Decide whether simple sequences converge or diverge.	PE:	765, 774–780, 781–783, 786–790, 791–793, 829–833
		TWE:	765, 774–780, 781–783, 786–790, 791–793, 829–833
PC.7.6	Solve word problems involving applications of sequences and series.	PE:	759, 762, 764–765, 766, 768, 770, 772–773, 774, 779, 781–783, 786–789, 791–793, 798–800, 804–805, 811–814, 821, 827–828, 833
		TWE:	759, 762, 764–765, 766, 768, 770, 772–773, 774, 779, 781–783, 786–789, 791–793, 798–800, 804–805, 811–814, 821, 827–828, 833
Data Analysis			
Students model data with linear and non-linear functions.			
PC.8.1	Find linear models using the median fit and least squares regression methods. Decide which model gives a better fit.	PE:	38–44, 51, 60, 744–745, 747
		TWE:	38–44, 51, 60, 744–745, 747
PC.8.2	Calculate and interpret the correlation coefficient. Use the correlation coefficient and residuals to evaluate a “best-fit” line.	PE:	40, 41–44, 51, 60, 258–259, 270, 573
		TWE:	40, 41–44, 51, 60, 258–259, 270, 573

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OBJECTIVES	PAGE REFERENCES
PC.8.3 Find a quadratic, exponential, logarithmic, power, or sinusoidal function to model a data set and explain the parameters of the model.	PE: 387–390, 391–394, 704, 706, 708–711, 712–713, 714–717, 740–744, 745–748 TWE: 387–390, 391–394, 704, 706, 708–711, 712–713, 714–717, 740–744, 745–748
Mathematical Reasoning and Problem Solving	
Students use a variety of strategies to solve problems	
PC.9.1 Use a variety of problem-solving strategies, such as drawing a diagram, guess-and-check, solving a simpler problem, examining simpler problems, and working backwards.	PE: 71–72, 115–116, 210–212, 271, 348–351, 427–430, 557–560, 675–677, 781–783, 843, 862, 867, 873, 893–896, 946–948 TWE: 71–72, 115–116, 210–212, 271, 348–351, 427–430, 557–560, 675–677, 781–783, 843, 862, 867, 873, 893–896, 946–948
PC.9.2 Decide whether a solution is reasonable in the context of the original situation.	PE: 38–44, 67–70, 157, 325–326, 428–430, 461, 541, 611, 731, 850 TWE: 38–44, 67–70, 157, 325–326, 428–430, 461, 541, 611, 731, 850
Students develop and evaluate mathematical arguments and proofs	
PC.9.3 Decide if a given algebraic statement is true always, sometimes, or never (statements involving rational or radical expressions, trigonometric, logarithmic or exponential functions).	PE: 6–8, 57, 119, 205–209, 267, 291–296, 335, 413, 718–722, 749 TWE: 6–8, 57, 119, 205–209, 267, 291–296, 335, 413, 718–722, 749
PC.9.4 Use the properties of number systems and order of operations to justify the steps of simplifying functions and solving equations.	PE: 67–70, 71–72, 73–76, 77, 98–102, 103–105, 120–123, 759–762, 763–765 TWE: 67–70, 71–72, 73–76, 77, 98–102, 103–105, 120–123, 759–762, 763–765

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OBJECTIVES		PAGE REFERENCES	
PC.9.5	Understand that the logic of equation solving begins with the assumption that the variable is a number that satisfies the equation, and that the steps taken when solving equations create new equations that have, in most cases, the same solution set as the original. Understand that similar logic applies to solving systems of equations simultaneously.	PE:	27–31, 32–37, 38–44, 67, 68, 69, 73–77, 78–86, 96, 107–111, 119–123
		TWE:	27–31, 32–37, 38–44, 67, 68, 69, 73–77, 78–86, 96, 107–111, 119–123
PC.9.6	Define and use the mathematical induction method of proof.	PE:	822–826, 827–828, 832, 833
		TWE:	822–826, 827–828, 832, 833

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