Precalculus
Course Information

Course Description:
Students will enhance their understanding of concepts learned in Algebra and Geometry while foreshadowing the important ideas and analytical skills of Calculus. Technology and various mathematical representations will be used to study the basic properties of functions and their properties. Topics will include: polynomial, power, rational, exponential, logarithmic, and trigonometric functions; parametric and polar equations; and modeling real life problems using algebraic, trigonometric and parametric equations.

Textbook: Precalculus: Graphical, Numerical, Algebraic, Sixth Edition, Pearson, 2004

Credit by Examination and Demonstration

To receive credit for Precalculus, students must earn a grade of 60% on the course examination. The two hour assessment will consist of both multiple choice and short/extended response items. The Credit Determination Committee will administer the exam**.**

Scoring Guidelines for Credit by Examination and Demonstration:

60% is required for a proficient score.

Grading Scale:

90% - 100% = A
80% - 89% = B
70% - 79% = C
60% - 69% = D
Below 60% = F

Course	Topic	Grade Level Indicators	Ohio Grade Level Indicators
Precalculus First Nine Weeks	**Functions and Graphs**	**A:11-A:04**	Identifies the intervals on which a function is increasing or decreasing.
		MP:11/12-H	Uses interval notation to describe domain and range and the solution to inequalities.
		Math A:11-A:03	Identifies removable, jump, and infinite discontinuities.
		Math A:11-A:03	Identifies boundedness of a function and intervals on which a function is bounded.
		A:12-A:07	Uses limit notation to describe asymptotic and end behaviors.
		A:11-A:03	Solves equations, inequalities, and systems of equations and inequalities graphically and algebraically.
		A:11-A:03	Identifies points of discontinuity and the intervals over which a function is continuous.
		A:11-A:03, Math MP:11-D:11, and D:11-A:04	Models real world data with functions.
		A:11-A:03	Determines points of discontinuity and intervals on which a function is continuous.
		A:11-A:03	Sketches graphs of basic functions and their transformations without technology.
		A:11-A:03	Connects geometric transformations on the graph to changes of parameters in an equation.
		A:11-A:03	Finds the composition of two or more functions.
		A:11-A:03	Writes a given function as the composition of simple functions.
		A:11-A:06	Determines the equation of an inverse relation.
		A:11-A:03	Uses the horizontal line test to determine if a relation is one-to-one.
		A:11-A:05	Explains the concept of even and odd functions and uses algebraic tests to determine symmetry.

	Polynomial, Power, and Rational Functions	**A:11-A:04**	Identifies the intervals on which a polynomial is increasing or decreasing and determines maxima and minima graphically (using technology).
		MP:11/12-H and A:11-A:03	Uses limit notation to describe asymptotic and end behaviors.
		A:11-A:03 and D:11-A:04	Models real world data with polynomial, power, and rational functions.
		A:11-A:03	Explains the relationship between the Fundamental Theorem of Algebra, the graph of a polynomial function, and the factors of the polynomial over the set of complex numbers.
		A:11-A:03	Identifies power functions and their graphs.
		A:11-A:04	Identifies the maximum and minimum points of polynomial and rational functions graphically and with technology.
		A:11-A:03	Analyzes end behavior of a function using limits.
		A:11-A:03	Explains the relationship between zeros, factors, and *x*-intercepts of the graph of a polynomial function, including the use of the Remainder, Factor, and Rational Zeros Theorems.
		A:11-A:03	Uses synthetic division to evaluate polynomials and find factors of polynomials.
		A:11-A:03	Determines horizontal, vertical, and slant asymptotes of rational functions.
		A:11-A:03	Determines points of discontinuity and intervals on which a function is continuous.
		A:11-A:03	Connects geometric transformations on the graph of a polynomial or rational function to changes of parameters in an equation.

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Precalculus Third Nine Weeks	**Exponential Logarithmic, and Logistic Functions**	**A:11-A:11**	Describes how a change in the value of a constant in an exponential, logarithmic, or logistic equation affects the graph of the equation.
		A:12-A:03	Identifies exponential and logarithmic functions to any base including *e* and natural log.
		A:12-A:04	Identifies logarithmic and exponential equations as inverses and uses the relationship to solve equations.
		A:12-A:10	Recognizes *e* as $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$.
		A:12-A:03	Sketches the graph of exponential, logistic, and logarithmic functions (including base *e* and natural log) and their transformations.
		D:11-A:04	Models real world data with exponential, logarithmic, and logistic functions.
		A:12-A:04	Identifies the inverse of exponential and logarithmic functions including *e* and natural log.
		D:11-A:03 and A:11-A:04	Solves problems involving compound interest, annuities, growth, and decay.
		A:11-A:03	Solves exponential and logarithmic equations to any base including *e* and natural log.
		A:11-A:03	Applies the rules of logarithms.
		D:12-A:02	Transforms bivariate data so it can be modeled by a function; e.g., uses logarithms to allow nonlinear relationships to be modeled by linear functions.

Course	Topic	Grade Level Indicators	Ohio Grade Level Indicators
Precalculus Fourth Nine Weeks	**Trigonometry and Trigonometric Functions**	**M:11-B:02**	Converts between degrees and radians and can explain the appropriate use of each.
		G:12-D:02	Sets up and solves angular velocity and arc-length problems by using radian measure.
		A:12-A:03	Describes and compares the characteristics of the trigonometric functions; e.g., general shape, number of roots, domain and range, even or odd asymptotic and global behavior for sine, cosine, tangent, cotangent, cosecant, and secant both algebraically and graphically.
		A:12-A:03	Relates a given sine or cosine graph to its equivalent other in terms of phase shift.
		A:12-A:03	Determines all zeros for a trigonometric function algebraically and also gives all zeros within a given range (such as between 0 and 2π radians).
		A:12-A:03	Identifies the amplitude, frequency/period, phase shift, vertical shift, etc. of a given trigonometric function and uses these to sketch a graph of the function.
		A:12-A:03	Identifies the extrema of trigonometric functions with and without technology.
		G:11-A:04	Uses the unit circle to explain the circular properties and periodic nature of trigonometric functions and to find the trigonometric ratios of any angle.
		A:12-A:03	Uses the unit circle to explain the periodic nature of the sine and cosine functions, the nature of reference angles, and the range of possible values for sine and cosine.
		A:12-A:04	Represents the inverse of a trigonometric function symbolically and graphically.
		D:11-A:04	Plots bivariate data and determines the trigonometric function that best fits the data both analytically and by regression.
		A:12-A:03	Determines phase shift, vertical shift, amplitude and frequency to be able to create the trigonometric function equation best fitting the data.
		D:11-C:04	Collects real world motion data and models it using trigonometric equations.

		G:12-A:02	Verifies identities analytically by applying fundamental trigonometric identities to re-write and combine expressions.
		G:12-A:02	Verifies trigonometric identities graphically.
		G:11-A:04	Uses the double-angle, half-angle, and angle-addition formulas to determine specified trigonometric values.
		G:11-A:04	Uses trigonometric relationships to determine lengths and angle measures; i.e., Law of Sines and Law of Cosines.
		G:11-A:04	Uses the Law of Sines and the Law of Cosines to determine the missing angles or sides of triangles.
		G:11-A:04	Uses Heron's formula to find the area of a triangle when the sides are known but base and/or height are not given.
		G:11-A:04	Determines general solutions to trigonometric equations and specific solutions within a given interval.

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Precalculus Fourth Nine Weeks	**Noncartesian Representations**	**G:11-B:03**	Performs vector addition and vector multiplication by a scalar.
		N:11-B:02	Determines if two or more vectors are parallel or perpendicular.
		A:11-D:07	Given a vector, creates vectors which are parallel or perpendicular to it.
		N:11-D:09	Uses trigonometric ratios to perform decomposition of vectors into its component horizontal and vertical vectors.
		N:11-D:09	Converts between Cartesian and parametric representations.
		A:11-D:09	Uses a graphing calculator to model problems given in parametric format.
		A:12-A:09	Converts back and forth between Cartesian and polar coordinates.
		A:12-B:01	Graphs polar equations by hand and with a graphing calculator.
		A:12-B:01	Identifies the form and properties of the graph of a polar equation.
		N:11-D:09	Converts coordinates back and forth between trigonometric and Cartesian form.
		A:11-B:08	Uses a calculator to verify the n^{th} roots of a given complex number.