Hamburg Area School District
Course Guide

UNITING TALENT & PASSION

Every Child Without Exception

Name:	Honors Precalculus (1375)
Grade(s):	*11-12*
Length:	*Place an X next to the correct option*
X	Full-Year (180 Sessions)
	Semester (90 Sessions)
	Quarter (45 Sessions)
	Other (Specify):
Text:	*Precalculus with Limits: A Graphing Approach*, Larson, Sixth Edition, Cengage Learning.
Approved on:	2015 (Reviewed 2021-2022)

Description:

This college level course is designed for those students who plan to take AP Calculus. It includes a thorough discussion of solving equations and inequalities. An introduction to theory of equations is also covered. The study of trigonometry covers the definitions and properties. Identities are covered in depth along with their use in solving equations. Solution of right and oblique triangles is studied along with using logarithms to perform more complex arithmetic operations and to solve logarithmic equations. Graphing of functions is covered in depth including polynomial, rational, exponential, logarithmic and trigonometric. Polar coordinates and complex numbers are studied. Conic sections, vectors and determinants will be introduced.

Honors Precalculus

Unit: Coordinate Graphs

Unit Length: *6 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Rectangular Coordinates	Graph points. Use the distance formula. Use the midpoint formula.	M11.A.1.2 M11.A.2.2 M11.A.3.1 M11.B.1
Graphs of Equations	Graph equations by hand. Graph equations using a graphing utility. Find intercepts. Test and equation for symmetry with respect to the x-axis, y-axis, and origin.	M11.A.3.1 M11.D.1.1 M11.D.2.1
Solving Equations	Solve linear equations. Solve quadratic equations by factoring. Solve quadratic equations using the quadratic formula. Solve equations involving absolute value. Solve radical equations.	M11.A.2.2 M11.A.3.1 M11.D.2.1 M11.D.2.2 M11.D.4.1
Solving Inequalities	Use interval notation. Use properties of inequalities. Solve linear inequalities algebraically. Solve absolute value inequalities algebraically. Solve combined inequalities algebraically.	M11.D.2.1
Lines	Calculate and interpret the slope of a line. Graph lines. Find the equations of vertical and horizontal lines. Write the equation of a line in point-slope form, slope-intercept form, and general form. Define and find equations of parallel and perpendicular lines.	M11.D.2.1 M11.D.3.1 M11.D.3.2
Circles	Write the standard form of the equation of a circle. Graph a circle by hand.	M11.C.1.1

	Find the center and radius of a circle from an equation in general form.	
Scatter diagrams and linear curve fitting	Draw and interpret scatter diagrams. Distinguish between linear and nonlinear relations. Find the line of best fit.	M11.D.3.1 M11.D.3.2 M11.E.1.1 M11.E.4.2

Unit: Functions
Unit Length: *8 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Functions	Determine whether a relation represents a function. Find the value of a function. Find the domain of a function. Identify the graph of a function. Obtain information from or about the graph of a function.	M11.D.3.1
Characteristics of functions	Find the average rate of change of a function. Locate local maxima and minima. Determine where a function is increasing and decreasing. Determine even or odd functions from a graph and the equation.	M11.D.3.1
Library of functions including piecewise-defined functions	Graph linear, constant, identity, square, cube, square root, reciprocal, absolute value, greatest-integer, and piecewise-defined functions.	M11.A.2.2 M11.D.1.1 M11.D.4.1
Graphing techniques: transformations	Graph functions using horizontal and vertical shifts. Graph functions using compressions and stretches. Graph functions using reflections about the x-axis and y-axis.	M11.A.2.2 M11.B.2.3 M11.D.1.1
Operations on functions including composite functions	Form the sum, difference, product, and quotient of two functions. Form the composite function and find its domain.	M11.A.2.2 M11.B.2.3 M11.D.1.1

Unit: Polynomial and Rational Functions
Unit Length: *3 Weeks*

ESSENTIAL QUESTION-ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ANCHORS
Quadratic functions and curve fitting	Graph a quadratic function by hand. Identify the vertex and axis of symmetry of a quadratic function. Determine the maximum or minimum value of a quadratic function. Use the maximum and minimum to solve applied problems. Find the quadratic function of best fit to data.	M11.D.3.1 M11.D.4.1 M11.E.1.1
Power functions and curve fitting	Graph transformations of power functions. Find the power function of best fit to data.	M11.D.3.1 M11.D.4.1 M11.E.1.1
Polynomial functions and curve fitting	Identify polynomials and their degree. Identify the zeros of a polynomial and their multiplicity. Analyze the graph of a polynomial. Find the cubic function of best fit to data.	M11.D.3.1 M11.D.4.1 M11.E.1.1 M11.D.2.2
Rational functions and analyzing graphs	Find the domain of a rational function. Determine the vertical asymptotes of a rational function. Determine the horizontal or oblique asymptotes of a rational function. Analyze the graph of a rational function. Solve applied problems of rational functions.	M11.D.3.1 M11.D.4.1 M11.E.1.1

Unit: Zeros of a Polynomial Function

Unit Length: *3 weeks*

ESSENTIAL QUESTION-ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ANCHORS
Real zeros of a polynomial function	Use the remainder and factor theorems. Use Descartes' rule of signs to determine the number of positive and negative real zeros of a polynomial function. Use the rational zeros theorem to list the potential rational zeros of a polynomial function. Find the real zeros and solve polynomial functions. Use the theorem for bounds on zeros and the intermediate value theorem.	M11.D.2.2 M11.D.4.1
Complex numbers and quadratic equations with a negative discriminant	Add, subtract, multiply, and divide complex numbers. Solve quadratic equations with a negative discriminant.	M11.D.2.2 M11.D.4.1
Complex zeros and the fundamental theorem of algebra	Utilize the conjugate pairs theorem to find the complex zeros of a polynomial. Find a polynomial function with specified zeros. Find the complex zeros of a polynomial.	M11.D.2.2 M11.D.4.1
Polynomial and rational inequalities	Solve polynomial inequalities graphically and algebraically. Solve rational inequalities graphically and algebraically.	M11.D.2.2 M11.D.4.1

Honors Precalculus

Unit: Exponential and Logarithmic Functions
Unit Length: _4 weeks_

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
One-to-one functions and inverse functions	Determine whether a function is one-to-one. Obtain the graph of the inverse function from the graph of the function. Find an inverse function.	M11.A.1.2
Exponential functions	Evaluate exponential functions. Graph exponential functions. Define the number e. Solve exponential equations.	M11.A.2.2 M11.D.3.1 M11.D.4.1
Logarithmic functions	Change exponential expressions to logarithmic expressions and vice versa. Evaluate logarithmic functions. Determine the domain of a logarithmic function. Graph logarithmic functions. Solve logarithmic equations.	M11.A.2.2 M11.D.3.1 M11.D.4.1
Properties of Logarithms	Write a logarithmic expression as a sum or difference of logarithms. Write a logarithmic expression as a single logarithm. Evaluate logarithms whose base is neither 10 nor e. Graph logarithmic functions whose base is neither 10 nor e.	M11.A.2.2 M11.D.3.1 M11.D.4.1
Logarithmic and exponential equations	Solve logarithmic equations using the properties of logarithms. Solve exponential equations.	M11.A.2.2 M11.D.3.1 M11.D.4.1
Growth and decay	Find equations of populations that obey the law of uninhibited growth. Find equations of populations that obey the law of decay. Use Newton's law of cooling.	M11.A.2.2 M11.D.3.1 M11.D.4.1

Exponential, logarithmic, and logistic curve fitting	Determine the model of best fit for exponential, logarithmic, and logistic functions.	M11.A.2.2 M11.D.3.1 M11.D.4.1

Honors Precalculus

Unit: Trigonometric Functions
Unit Length: _5 weeks_

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Angles and their measure	Convert between degrees, minutes, seconds, and decimal forms for angles. Find the arc length of a circle. Convert from degrees to radians and vice versa. Find the linear speed of an object traveling in circular motion.	M11.B.2.1
Trigonometric functions with the unit circle approach	Find the exact value of the trigonometric functions using a point on the unit circle and of quadrangle angles. Find the exact value of the trigonometric functions of 30, 45, and 60 degrees. Use a calculator to approximate the value of the trigonometric functions.	M11.B.2.1
Properties of the trigonometric functions	Determine the domain and range of the trigonometric functions. Determine the period of the trigonometric functions. Determine the signs of the trigonometric function. Find the value of the trigonometric functions utilizing fundamental identities.	M11.B.2.1 M11.C.1.2
Graphs of the sine and cosine functions	Graph transformations of the sine and cosine functions.	M11.B.2.1 M11.C.1.2
Graphs of the tangent, cotangent, secant, and cosecant functions	Graph transformations of the tangent, cotangent, secant, and cosecant functions.	M11.B.2.1 M11.C.1.2
Sinusoidal graphs and curve fitting	Determine the amplitude and period of sinusoidal functions.	M11.B.2.1 M11.C.1.2

| | Find an equation for a sinusoidal function. Determine the phase shift of a sinusoidal function. Graph sinusoidal functions. Find a sinusoidal function from data. | |

Honors Precalculus

Unit: Analytic Trigonometry
Unit Length: *5 weeks*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Trigonometric identities	Establish identities.	M11.D.2.2 M11.D.3.1
Sum and difference formulas	Use sum and difference formulas to find exact values. Use sum and difference formulas to establish identities.	M11.D.2.2 M11.D.3.1
Double-angle and half-angle formulas	Use double -angle formulas to find exact values. Use double-angle and half-angle formulas to establish identities. Use half-angle formulas to find exact values.	M11.D.2.2 M11.D.3.1
Inverse trigonometric functions	Find the exact value of an inverse trigonometric function. Find the approximate value of an inverse trigonometric function. Find the exact value of expressions involving inverse trigonometric functions. Write a trigonometric expression as an algebraic expression. Establish identities involving inverse trigonometric expressions.	M11.D.2.2 M11.D.3.1
Trigonometric equations	Solve equations involving a single trigonometric function. Solve trigonometric equations that are quadratic in form. Solve trigonometric equations using identities. Solve trigonometric equations linear in sine and cosine.	M11.D.2.2 M11.D.3.1 M11.D.4.1

Honors Precalculus

Unit: Applications of Trigonometric Functions
Unit Length: *1.5 weeks*

ESSENTIAL QUESTION-ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ANCHORS
Right triangle trigonometry	Find the value of trigonometric functions of acute angles. Use the complimentary angle theorem. Solve right triangles. Solve applied problems.	M11.C.1.4 M11.C.1.2
Law of sines	Solve SAA, ASA, and SSA triangles. Solve applied problems.	M11.C.1.2
Law of cosines	Solve SAS and SSS triangles. Solve applied problems.	M11.C.1.2
Area of a triangle	Find the area of SAS and SSS triangles.	M11.C.1.2
Simple harmonic motion	Find an equation for an object in simple harmonic motion. Analyze simple harmonic motion.	M11.C.1.2

Unit: Polar Coordinates
Unit Length: *1 week*

ESSENTIAL QUESTION-ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ANCHORS
Polar coordinates	Plot points using polar coordinates. Convert from polar coordinates to rectangular coordinates and vice versa.	M11.B.2.1 M11.C.1.1
Polar equations and graphs	Graph and identify polar equations by converting to rectangular equations. Graph polar equations using a graphing utility.	M11.B.2.1 M11.C.1.1

Unit:　　　　　Analytic Geometry
Unit Length:　*1 week*

ESSENTIAL QUESTION- ESSENTIAL CONTENT	PERFORMANCE OBJECTIVES	STANDARDS/ ANCHORS
Conics	Know the names of the conics.	M11.C.1
Parabola	Graph parabolas.	M11.C.1
Ellipse	Graph ellipses. Discuss the equation of an ellipse.	M11.C.1
Hyperbola	Discuss the equation of a hyperbola.	M11.C.1