Information for Course Syllabus

Name of Course: Precalculus AB SWDC

Grade Level: 10-12

School: ORHS

Major Assignments: None

Field Trips: None

How can parents access instructional materials? Canvas

Precalculus AB SWDC
2021-2022

Term 1

Graphing and Characteristics of Functions	**P.F.BF.A.1** Understand how the algebraic properties of an equation transform the geometric properties of its graph. *For example, given a function, describe the transformation of the graph resulting from the manipulation of the algebraic properties of the equation (i.e., translations, stretches, reflections, and changes in periodicity and amplitude.)*
	P.F.IF.A.2 Analyze qualities of exponential, polynomial, logarithmic, trigonometric, and rational functions and solve real world problems that can be modeled with these functions (by hand and with appropriate technology).
	P.F.IF.A.1 Determine whether a function is even, odd, or neither.
	P.F.IF.A.6 Visually locate critical points on the graphs of functions and determine if each critical point is a minimum, a maximum, or point of inflection. Describe intervals where the function is increasing or decreasing and where different types of concavity occur.
	P.F.BF.A.4 Construct the difference quotient for a given function and simplify the resulting expression.
	P.F.BF.A.3 Compose functions.

Piecewise, Absolute Value, Quadratics, and Radical Functions	**P.A.REI.A.3** Solve nonlinear inequalities (quadratic, trigonometric, conic, exponential, logarithmic, and rational) by graphing (solutions in interval notation if one-variable), by hand and with appropriate technology.
	P.A.REI.A.4 Solve systems of nonlinear inequalities by graphing.
	P.F.BF.A.1 Understand how the algebraic properties of an equation transform the geometric properties of its graph.
	P.F.IF.A.4 Identify the real zeros of a function and explain the relationship between the real zeros and the x-intercepts of the graph of a function (exponential, polynomial, logarithmic, trigonometric, and rational).
	P.F.IF.A.5 Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$.
	P.F.IF.A.6 Visually locate critical points on the graphs of functions and determine if each critical point is a minimum, a maximum, or point of inflection. Describe intervals where the function is increasing or decreasing and where different types of concavity occur.
	P.N.CN.B.6 Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.
	P.N.NE.A.4 Simplify and solve complex radical expressions; discuss and display understanding that rational numbers are dense in the real numbers and integers are not.

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Higher Order Polynomial Functions	**P.F.IF.A.2** Analyze qualities of exponential, polynomial, logarithmic, trigonometric, and rational functions and solve real world problems that can be modeled with these functions (by hand and with appropriate technology).
	P.F.IF.A.4 Identify the real zeros of a function and explain the relationship between the real zeros and the x-intercepts of the graph of a function (exponential, polynomial, logarithmic, trigonometric, and rational).
	P.F.IF.A.5 Identify characteristics of graphs based on a set of conditions or on a general equation such as $y = ax^2 + c$.
	P.F.IF.A.6 Visually locate critical points on the graphs of functions and determine if each critical point is a minimum, a maximum, or point of inflection. Describe intervals where the function is increasing or decreasing and where different types of concavity occur.
	P.N.NE.A.3 Classify real numbers and order real numbers that include transcendental expressions, including roots and fractions of pi and e.
	P.N.CN.B.6 Extend polynomial identities to the complex numbers. For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.
	P.N.CN.B.7 Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Rational Functions	**P.F.IF.A.2** Analyze qualities of exponential, polynomial, logarithmic, trigonometric, and rational functions and solve real world problems that can be modeled with these functions (by hand and with appropriate technology).
	P.F.IF.A.4 Identify the real zeros of a function and explain the relationship between the real zeros and the x-intercepts of the graph of a function (exponential, polynomial, logarithmic, trigonometric, and rational).
	P.F.IF.A.6 Visually locate critical points on the graphs of functions and determine if each critical point is a minimum, a maximum, or point of inflection. Describe intervals where the function is increasing or decreasing and where different types of concavity occur.
	P.F.IF.A.7 Graph rational functions, identifying zeros, asymptotes (including slant), and holes (when suitable factorizations are available) and showing end behavior.
	P.A.REI.A.3 Solve non-linear inequalities (quadratic, trigonometric, conic, exponential, logarithmic, and rational) by graphing (solutions in interval notation if one-variable), by hand and with appropriate technology.
	P.A.REI.A.4 Solve systems of nonlinear inequalities by graphing.

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Exponential and Logarithmic Functions	**P.F.BF.A.3** Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.
	P.F.BF.A.5 Find inverse functions (including exponential, logarithmic, and trigonometric). a. Calculate the inverse of a function, *f(x)*, with respect to each of the functional operations; in other words, the additive inverse, *-f(x)*, the multiplicative inverse, 1/*f(x)*, and the inverse with respect to the composition. b. Verify by composition that one function is the inverse of the other. c. Read values of an inverse function from a graph or a table, given that the function has an inverse. d. Recognize a function is invertible if and only if it is one-to-one. Produce an invertible function from a non-invertible function by restricting the domain.
	P.F.BF.A.6 Explain why the graph of a function and its inverse are reflections of one another over the line y = x.
	P.N.NE.A.1 Use the laws of exponents and logarithms to expand or collect terms in expressions; simplify expressions or modify them in order to analyze them or compare them.
	P.N.NE.A.2 Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
	P.F.IF.A.2 Analyze qualities of exponential, polynomial, logarithmic, trigonometric, and rational functions and solve real world problems that can be modeled with these functions (by hand and with appropriate technology).
	P.F.IF.A.4 Identify the real zeros of a function and explain the relationship between the real zeros and the x-intercepts of the graph of a function (exponential, polynomial, logarithmic, trigonometric, and rational).
	P.S.MD.A.1 Create scatter plots, analyze patterns and describe relationships for bivariate data (linear, polynomial, trigonometric or exponential) to model real-world phenomena and to make predictions.
	P.S.MD.A.2 Determine a regression equation to model a set of bivariate data. Justify why this equation best fits the data.
	P.S.MD.A.3 Use a regression equation, modeling bivariate data, to make predictions. Identify possible considerations regarding the accuracy of predictions when interpolating or extrapolating.

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Trigonometric Functions	**P.F.TF.A.1** Convert from radians to degrees and degrees to radians.
	P.F.TF.A.2 Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$, $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.
	P.F.TF.A.3 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

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Term 2

Trigonometric Functions (cont.)	**P.N.NE.A.3** Classify real numbers and order real numbers that include transcendental expressions, including roots and fractions of pi and e.
	P.F.GT.A.1 Interpret transformations of trigonometric functions.
	P.F.GT.A.2 Determine the difference made by choice of units for angle measurement when graphing a trigonometric function.
	P.F.GT.A.3 Analyze qualities of exponential, polynomial, logarithmic, trigonometric, and rational functions and solve real world problems that can be modeled with these functions (by hand and with appropriate technology).
	P.F.TF.A.4 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
	P.S.MD.A.1 Create scatter plots, analyze patterns and describe relationships for bivariate data (linear, polynomial, trigonometric or exponential) to model real-world phenomena and to make predictions.
	P.S.MD.A.2 Determine a regression equation to model a set of bivariate data. Justify why this equation best fits the data.

Analytic Trigonometry	**P.G.TI.A.1** Apply trigonometric identities to verify identities and solve equations. Identities include: Pythagorean, reciprocal, quotient, sum/difference, double-angle, and half-angle.
	P.G.TI.A.2 Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
	P.F.GT.A.6 Determine the appropriate domain and corresponding range for each of the inverse trigonometric functions.
	P.F.GT.A.7 Graph the inverse trigonometric functions and identify their key characteristics.
	P.F.GT.A.4 Find values of inverse trigonometric expressions (including compositions), applying appropriate domain and range restrictions.
	P.F.GT.A.5 Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
	P.F.GT.A.8 Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

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Right Triangle Trigonometry and Applications of Trigonometric Functions	**P.G.AT.A.1** Use the definitions of the six trigonometric ratios as ratios of sides in a right triangle to solve problems about lengths of sides and measures of angles.
	P.G.AT.A.2 Derive the formula A = ½ absin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
	P.G.AT.A.3 Derive and apply the formulas for the area of a sector of a circle.
	P.G.AT.A.4 Calculate the arc length of a circle subtended by a central angle.
	P.G.AT.A.5 Prove the Law of Sines and Cosines and use them to solve problems
	P.G.AT.A.6 Understand and apply the Law of Sines (including the ambiguous case) and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Vectors	**P.N.VM.A.1** Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes. (e.g., v, |v|, ||v||, v).
	P.N.VM.A.2 Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
	P.N.VM.A.3 Solve problems involving velocity and other quantities that can be represented by vectors.
	P.N.VM.B.4 Add and subtract vectors.
	P.N.VM.B.5 Multiply a vector by a scalar.
	P.N.VM.B.6 Calculate and interpret the dot product of two vectors.

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Polar	**P.G.PC.A.1** Graph functions in polar coordinates.
	P.G.PC.A.2 Convert between rectangular and polar coordinates.
	P.G.PC.A.3 Represent situations and solve problems involving polar coordinates.
	P.N.CN.A.1 Perform arithmetic operations with complex numbers expressing answers in the form a + bi.
	P.N.CN.A.2 Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
	P.N.CN.A.3 Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
	P.N.CN.A.4 Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example, (-1 + 3i)3 = 8 because (-1 + 3i) has modulus 2 and argument 120 degrees.*
	PN.CN.A.5 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.

Conics and Parametrics	**P.A.C.A.1** Display all of the conic sections as portions of a cone.
	P.A.C.A.3 From an equation in standard form, graph the appropriate conic section: ellipses, hyperbolas, circles, and parabolas. Demonstrate an understanding of the relationship between their standard algebraic form and the graphical characteristics.
	P.A.C.A.4 Transform equations of conic sections to convert between general and standard form.
	P.A.C.A.2 Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.
	P.A.PE.A.1 Graph curves parametrically (by hand and with appropriate technology).
	P.A.PE.A.2 Eliminate parameters by rewriting parametric equations as a single equation.

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Sequences & Series	**P.A.S.A.1** Demonstrate an understanding of sequences by representing them recursively and explicitly**.**
	P.A.S.A.2 Use sigma notation to represent a series; expand and collect expressions in both finite and infinite settings.
	P.F.IF.A.8 Recognize that sequences are functions, sometimes defined recursively, showe domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n + 1) = f(n) + f(n-1)$ for $n \geq 1$.
	P.A.S.A.3 Derive and use the formulas for the general term and summation of finite and infinite arithmetic and geometric series, if they exist.
	P.A.S.A.4 Recognize a finite geometric series (when the common ratio is not 1), and use the sum formula to solve problems in context.
	P.A.S.A.5 Know and apply the Binomial Theorem for the expansion of $(x + y)n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.

A Preview of Calculus	1. Find limits using tables and graphs.
	2. Find limits using algebraic techniques.
	3. Find one-side limits and limits of continuous functions.
	4. Find an equation of a tangent line and calculate the derivative of a function..