Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA79624	Grade Level	9, 10, 11, 12
Course Name	Honors Precalculus A	# of Credits	0.5
SCED Code	02110H0.5012	Curriculum Type	Connections Academy

COURSE DESCRIPTION

This is the first of two courses that comprise Honors Precalculus. In this course, the student will continue to study higher-level mathematics. The student will begin by reviewing the fundamental concepts in algebra that serve as building blocks for an in-depth study of functions and graphs. Next, the student will explore and analyze polynomial, rational, radical, exponential, logarithmic, and piecewise functions. The student will further delve into quadratics with a unit on the conic sections. Finally, the student will explore sequences and series.

A semester-long project will give the Honors Precalculus student the opportunity to apply math in an engineering setting. The student will devote time during each unit to work on this project and submit the final product before the semester review unit.

A content thread throughout the course focuses on ways mathematics is applied in the real world and is essential to everyday life. These real-world connections, combined with an emphasis on mathematical reasoning and critical thinking skills, prepare the student for future college and career opportunities.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK
N.CN.1	Know there is a complex number i such that i^2 = −1, and every complex number has the form a + bi with a and b real.
N.CN.2	Use the relation i^2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
N.CN.3	(+)Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
N.CN.5	(+)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°.
N.CN.6	(+)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.
N.CN.7	Solve quadratic equations with real coefficients that have complex solutions.
A.SSE.1a	Interpret parts of an expression, such as terms, factors, and coefficients.*
A.SSE.3	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*
A.APR.1	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
A.APR.2	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).
A.APR.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.
A.APR.6	Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a
A.APR.7	(+)Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.
A.CED.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.*
A.REI.4	Solve quadratic equations in one variable.
F.IF.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x.
F.IF.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate
F.IF.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*
F.IF.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.*
F.IF.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
F.IF.7c	Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*
F.IF.7d	(+)Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.*
F.IF.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
F.IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
F.IF.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
F.IF.8b	Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^(12t), y = (1.2)^(t/10), and classify them as representing exponential growth and decay.

F.IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger
F.BF.1	Write a function that describes a relationship between two quantities.*
F.BF.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
F.BF.1b	Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
F.BF.1c	(+)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.
F.BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*
F.BF.4	Find inverse functions.
F.BF.4a	Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2(x^3) or f(x) = (x+1)/(x-1) for x ≠ 1 (x not equal to 1).
F.BF.4b	(+)Verify by composition that one function is the inverse of another.
F.BF.4c	(+)Read values of an inverse function from a graph or a table, given that the function has an inverse.
F.BF.5	(+)Build new functions from existing functions. Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.
F.LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.*
F.LE.1a	Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.*
F.LE.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*
F.LE.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*
F.LE.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*
F.LE.3	Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratic ally, or (more generally) as a polynomial function.*
F.LE.4	For exponential models, express as a logarithm the solution to ab^(CT) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.*
F.LE.5	Interpret the parameters in a linear or exponential function in terms of a context.*
G.GPE.1	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
G.GPE.2	Derive the equation of a parabola given a focus and directory.
G.GPE.3	(+)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.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES
Unit 1: Welcome to Precalculus In this unit, you will review many of the prerequisite skills and concepts you will apply in your study of precalculus. The unit begins with an explanation of the name of the course and tips for getting organized for success in the course. This is followed by four lessons to help you recall topics you have learned previously so you are prepared to expand your understanding of them. These include working with a set of complex numbers, solving equations, and analyzing the graphs of functions.	N.CN.1; N.CN.2; N.CN.3; N.CN5; N.CN.6; N.CN.7; A.SSE.1; A.SSE.3; A.CED.4; A.REI.4; F.IF.1; F.IF.5	•Distinguish between previous mathematics courses and precalculus •Simplify algebraic expressions and solve algebraic equations •Determine whether a relation is a function from its graph •Identify the subsets of complex numbers and their relationships •Perform calculations with complex numbers
Unit 2: Function Algebra In this unit, you will explore all aspects of functions, including domain and range, from equations. You will compute the sum, difference, product, and quotient of functions and interpret the results. In addition, you will explore the composition of functions. You will determine whether a function has an inverse. Throughout the unit, you will discover applications for the concepts you are learning.	F.IF.1; F.IF.5; F.BF.1; F.BF.1a; F.BF.1b; F.BF.1c; F.BF.4; F.BF.4a; F.BF.4b; F.BF.4c; F.BF.5	•Determine the domain and range of a function given its algebraic representation or its graph •Compute, graph, and interpret the sum, difference, product, quotient, and composition of two functions •Determine whether a function has an inverse that is also a function and, if so, find the inverse algebraically or by graphing •Use the composition of functions to verify the inverse
Unit 3: Graph Behavior In this unit, you will explore aspects of functions from graphs. You will identify and interpret significant points on the function's graph. In addition, you will identify and classify points of discontinuity on a graph. Finally, you will explore the graphs of different families of functions, and transformations of the parent functions.	F.IF.4; F.IF.5; F.IF.7; F.IF.7a; F.IF.7b; F.IF.7c; F.IF.7d; F.IF.7e; F.IF.8; F.IF.8a; F.IF.8bF.IF.9; F.LE.1	•Identify and interpret significant points on a graph •Identify types of discontinuities in a graph •Interpret function transformations graphically •Recognize the graphs of the parent functions of power, root, exponential, and logarithmic functions

Unit 4: Polynomial and Rational Functions In this unit, you will explore aspects of polynomial and rational equations with real coefficients. You will evaluate computations with complex numbers, polynomials, and rational expressions. In addition, you will prove that the sets of complex numbers and rational expressions are closed under the four arithmetic operations. You will compare and contrast the families of functions you have studied using various representations. Finally, you will learn about and apply the Intermediate and Extreme Value Theorems.	A.APR.1; A.APR.2; A.APR.3; A.APR.6; A.APR.7	•Determine the domain and range of polynomial and rational functions from their equations or their graphs •Determine the number and nature of the solutions of polynomial equations with real coefficients over the complex numbers •Use arithmetic operations with complex numbers, polynomial expressions, and rational expressions and confirm that the sets of complex numbers and rational expressions are closed under addition, subtraction, multiplication, and division •Compare and contrast the polynomial, rational, and radical families of functions and translate among their verbal, tabular, graphical, and symbolic representations •Apply the Intermediate and Extreme Value Theorems to identify key points on the graph of a function
Unit 5: Exponential, Logarithmic, Piecewise Functions In this unit, you will compare and contrast various aspects of exponential and logarithmic functions. You will translate among the various representations of these families of functions. You will also graph piecewise-defined functions and analyze them for points of discontinuity. Finally, you will identify and interpret functions for which there are no elementary algorithms for finding their zeroes and employ alternative strategies to find the zeroes.	F.LE.1; F.LE.1a; F.LE.1b; F.LE.1c; F.LE.2; F.LE.3; F.LE.4; F.LE.5	•Compare and contrast the exponential and logarithmic families of functions •Translate among verbal, tabular, graphical, and symbolic representations of power, exponential, logarithmic, and piecewise functions •Identify and interpret functions for which there are no elementary algorithms for finding zeroes •Graph piecewise functions and analyze them for points of discontinuity
Unit 6: Conic Sections In this unit, you will explore concepts in analytic geometry. You will write and graph the standard form of an equation for circles, ellipses, hyperbolas, and parabolas. You will identify conic sections and apply your knowledge to solve real-world problems.	G.GPE.1; G.GPE.2; G.GPE.3	•Determine the equation for a conic section from its locus •Analyze and graph quadratic equations •Model real-world scenarios with conic sections
Unit 7: Sequences and Series In this unit, you will be introduced to sequences and series. You will identify and generate arithmetic and geometric sequences. You will use sigma and factorial notation to write the terms and sum of a sequence. In addition, you will analyze a series to determine if it is convergent or divergent and calculate the sum of convergent series. Finally, you will model real-world situations using sequences and series.	F.BF.2	•Distinguish between arithmetic and geometric sequences •Define sequences and series in terms of functions (notation, range, domain, general term) •Apply sigma and factorial notation to a series •Determine convergence and divergence of a series and calculate sums of convergent series •Model real-world patterns and situations with recursive relationships, sequences, and series