Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA79873	Grade Level	9, 10, 11, 12
Course Name	Precalculus B	# of Credits	0.5
SCED Code	02110G0.5022	Curriculum Type	Connections Academy

COURSE DESCRIPTION

This is the second of two courses that comprise Precalculus. In this course, the student will continue to study higher-level mathematics. The student will expand knowledge of trigonometric concepts, including trigonometric functions and identities, before being introduced to polar coordinates and equations. Next, the student will explore vectors and parametric equations. Finally, the student will examine calculus concepts including limits and derivatives in preparation for studying calculus. 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.VM.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(bold), |v|, ||v||, v(not bold)).
N.VM.2	(+)Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
N.VM.3	(+)Solve problems involving velocity and other quantities that can be represented by vectors.
N.VM.4	(+)Add and subtract vectors.
N.VM.4a	(+)Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
N.VM.4b	(+)Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
N.VM.4c	(+)Understand vector subtraction v – w as v + (–w), where (–w) is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction
N.VM.5	(+)Multiply a vector by a scalar.
N.VM.5a	(+)Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(v(sub x), v(sub y)) = (cv(sub x), cv(sub y)).
N.VM.5b	(+)Compute the magnitude of a scalar multiple cv using ||cv|| = |c|v. Compute the direction of cv knowing that when |c|v ≠0, the direction of cv is either along v (for c > 0) or against v (for c < 0).
F.TF.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
F.TF.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
F.TF.3	(+)Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.
F.TF.4	(+)Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
F.TF.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*
F.TF.6	(+)Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
F.TF.7	(+)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.*
F.TF.8	Prove the Pythagorean identity (sin A)^2 + (cos A)^2 = 1 and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle.
F.TF.9	(+)Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
G.SRT.6	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
G.SRT.7	Explain and use the relationship between the sine and cosine of complementary angles.
G.SRT.8	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
G.SRT.9	(+)Derive the formula A = (1/2)ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.
G.SRT.10	(+)Prove the Laws of Sines and Cosines and use them to solve problems.
G.C.5	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.
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.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES

Unit 1: Introduction to Trigonometry In this unit, you will explore the unit circle. You will review angle and radian measure concepts including radian and degree measure. You will use the unit circle and right triangles to define and evaluate trigonometric functions of real numbers and solve real-world problems. Finally, you will calculate the values for trigonometric ratios using a right triangle and the unit circle.	F.TF.1; F.TF.2; F.TF.3; F.TF.4 G.C.5; G.GPE.1	•Use degree and radian measures for angles and convert between them •Use the unit circle and right triangles to define and evaluate trigonometric functions of real numbers •Develop the values of trigonometric functions at special angles in both radians and degrees
Unit 2: Trigonometric Functions In this unit, you will expand your knowledge of trigonometric functions. You will learn how to graph trigonometric functions and describe their behavior in terms of periodicity, amplitude, zeroes, asymptotes, and symmetries. In addition, you will learn how to translate the graphs of the trigonometric functions and interpret vertical and phase shifts. You will apply your knowledge to determine, graph, and use inverse trigonometric functions. Finally, you will solve real-world problems using trigonometric functions.	F.TF.5; F.TF.6; F.TF.7;	•Construct the graphs of the trigonometric functions and identify the domain and range •Describe the behavior of the trigonometric functions, including periodicity, amplitude, zeroes, asymptotes, and symmetries •Graph transformations of the trigonometric functions and interpret amplitude, frequency, period, and vertical and phase shifts •Graph and use the inverse trigonometric functions •Solve real-world problems with trigonometric functions
Unit 3: Trigonometric Identities and Applications In this unit, you will continue your study of trigonometric functions and identify fundamental identities. You will learn how to use these identities to verify and develop other trigonometric identities and formulas. In addition, you will prove the Law of Sines and Law of Cosines and use them to solve real-world problems. Finally, you will apply your knowledge of trigonometric functions to solve trigonometric equations.	F.TF.8; F.TF.9; G.SRT.6; G.SRT.7; G.SRT.8; G.SRT.9; G.SRT.10	•Use fundamental trigonometric identities to verify related identities •Develop and use trigonometric identities such as the sum and difference formulas, double-angle formulas, and the •Pythagorean trigonometric identities •Prove and apply the Law of Sines and Law of Cosines •Find all solutions of a trigonometric equation
Unit 4: Polar Coordinates and Functions In this unit, you will be introduced to polar coordinates and functions. You will plot points in the polar coordinate system and convert between rectangular and polar forms. You will also convert equations between rectangular and polar forms and graph polar equations of conics. In addition, you will use rectangular and polar representations of complex numbers and prove and apply DeMoivre's Theorem.		•Interpret and apply the modulus, argument, and conjugate of complex numbers •Convert points and equations between polar and rectangular forms •Graph polar functions, including the conics •Convert complex numbers between rectangular and polar forms •Prove and apply DeMoivre's Theorem
Unit 5: Vectors In this unit, you will explore vectors both algebraically and geometrically. You will be introduced to vector notation, including terms such as magnitude, direction, and resultant. You will learn how to find the components of a vector and use vector addition and scalar multiplication to solve problems. You will also learn how to use vector addition to model translations in the plane and use vectors to solve real-world problems.	N.VM.1; N.VM.2; N.VM.3; N.VM.4; N.VM.4a; N.VM.4b; N.VM.4c; N.VM.5; N.VM.5a; N.VM.5b	•Determine the components of a vector •Analyze the dot product of two vectors in algebraic and geometric settings •Model planar translations with vector addition •Solve real-world problems with vectors
Unit 6: Parametric Functions In this unit, you will be introduced to parametric equations as a way to represent the path of a moving object. You will learn how to convert between Cartesian and parametric equations. In addition, you will graph plane curves described by parametric equations and find parametric equations for a given graph.		•Analyze plane curves in parametric form •Convert equations between Cartesian or polar and parametric forms •Represent motion of a planar projectile using a parametric function •Identify advantages of parametric representations •Solve real-world problems using parametric functions
Unit 7: Looking Ahead to Calculus In this unit, you will be introduced to some fundamental concepts in calculus. You will calculate limits using tables, graphs, properties of limits, and algebraic methods. Then, you will explore derivatives of functions and find average and instantaneous rates of change and velocity. Finally, you will apply your knowledge of limits and derivatives to solve real-world problems.		•Find limits using tables, graphs, properties of limits, and algebraic methods •Determine continuity based on limits •Find the derivative of a function using the difference quotient •Recognize real-world application of derivatives

Unit 8: Semester Review and Exam In this unit, you will have the opportunity to prepare for and take the semester exam. Since this is a comprehensive exam, it may be helpful to organize your notes in the order of the course outline before you begin to review. Using the test-taking strategies that you have previously learned can help you be successful with both objective and essay questions.		•Review semester topics, concepts, and processes •Complete the semester exam