Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA79701	Grade Level	9, 10, 11, 12
Course Name	Calculus B	# of Credits	0.5
SCED Code	02121G0.5022	Curriculum Type	Connections Acadamey

COURSE DESCRIPTION

Calculus B introduces integration of functions, differential equations, and applications of integration. The student will calculate antiderivatives using a variety of methods including substitution. The student will evaluate integrals using a variety of methods including numerical integration. Then the student will understand and apply Riemann sums, definite integrals, and the Fundamental Theorem of Calculus. In particular, the student will differentiate and integrate logarithmic, exponential, and inverse trigonometric functions. The student will solve simple differential equations, which can be solved by separation of variables, and use the calculations to solve applied problems. The student will use integration to determine the area between two curves, volume, and surface area. Finally, the student will apply integration to determine work, center of mass, and fluid force.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK
F.IF.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
F.IF.4	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*
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 domain for the function.*
F.IF.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*
F.IF.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
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 maximum.
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.4	Find inverse functions.
F.BF.4c	(+)Read values of an inverse function from a graph or a table, given that the function has an inverse.
F.LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.*
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.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.*
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.*
G.GMD.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*
G.MG.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMESW

Unit 1: Integration In this unit, you will learn the fundamentals of integration, a key concept of calculus. You will use integration to find the area of regions, apply the Fundamental Theorem of Calculus, compare differentiation and integration, and study the Trapezoidal Rule and Simpson's Rule. In addition, you will research Georg Riemann, a German mathematician who made significant contributions to geometry and calculus.	F.IF.2; F.IF.4; F.IF.5; F.BF.1	•Fundamentals of integration find the area of a region using limits and integrals •Fundamental Theorem of Calculus integration by substitution
Unit 2: Logarithmic, Exponential, and other Transcendental In this unit, you will learn to apply integration to different functions, including trigonometric and hyperbolic functions. You will also explore how integration applies to the natural logarithmic function. You will learn how to use different functions to solve real-world problems, including the design of suspension bridges.	F.IF.2; F.IF.4; F.IF.5; F.IF.6; F.IF.7e; F.IF.8b; F.IF.9; F.BF.1; F.BF.4; F.BF.4c; F.LE.1; F.LE.1b; F.LE.1c; F.LE.2; F.LE.4; F.LE.5; F.TF.6; F.TF.7;	•review of inverse functions •how integration applies to the definition of the base of the natural logarithmic function •Exponential functions with bases other than e differentiate and integrate inverse trigonometric functions •differentiate and integrate hyperbolic functions and inverse hyperbolic functions
Unit 3: Differential Equations In this unit, you will use differentiation and integration to solve differential equations. You will use differential equations to solve real-world problems involving cooling and falling objects, temperature variance, and bacterial growth. In addition, you will learn how to solve logistic differential equations, first-order linear differential equations, and Bernoulli differential equations.	F.IF.6; F.BF.1a; F.LE.1c	•use differentiation and integration to solve differential equations •solve simple differential equations using separation of variables •model growth and decay in applied problems using exponential functions •solve logistic differential equations, first-order linear differential equations, and Bernoulli differential equations
Unit 4: Applications of Integration In this unit, you will continue to apply the technique of integration. Specifically, you will learn how to calculate the area of a section between two curves; determine volumes, arc lengths, and areas of a surfaces; and use the disc, washer, and shell methods to solve problems. In addition, you will learn how calculus applies to physics as you calculate the work done by a constant force.	F.BF.1; G.GMD.3; G.GMG.3	•use simple integration techniques to solve real-world problems •two ways you can find the upper and lower limits for the integr and the accumulation process of integration •find the volume of three-dimensional solids by using a variety of methods—the disk, washer, and shell methods •use cross sections to find the volume of a solid find the arc length of the graph of a function on an interval •find the area of a surface of revolution •use integration to solve physics problems
Unit 5: Final Review and Exam In this unit, you will have the opportunity to prepare for and take the final exam. The final exam may include any material that has been presented throughout the course. Since this is a comprehensive exam, it may be helpful to organize your notes and answers to questions before you begin to review.		•review materials from the course •complete the final exam