Wyoming Department of Education Required Virtual Education Course Syllabus

BIG HORN COUNTY SCHOOL DISTRICT #1

Program Name	WYCA	Content Area	Mathematics
Course ID	CAMA79680	Grade Level	9, 10, 11, 12
Course Name	Calculus A	# of Credits	0.5
SCED Code	02121G0.5012	Curriculum Type	Connections Academy

COURSE DESCRIPTION

Calculus A introduces limits, differentiation, and applications of differentiation. The student will find and evaluate finite and infinite limits graphically, numerically, and analytically. The student will find derivatives using a variety of methods including the chain rule and implicit differentiation. Then the student will use the first derivative test and the second derivative test to analyze and sketch functions. Finally, the student will find derivatives using a variety of methods including substitution.

WYOMING CONTENT AND PERFORMANCE STANDARDS

STANDARD#	BENCHMARK
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.SSE.3a	Factor a quadratic expression to reveal the zeros of the function it defines.
A.CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
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. The graph of f is the graph of the equation y = f(x).
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,
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.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.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.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.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.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

SCOPE AND SEQUENCE

UNIT OUTLINE	STANDARD#	OUTCOMES
Unit 1: Introduction Welcome to Calculus A. This brief unit introduces the course objectives and presents tips and grading guidelines for the Research Paper, which you will work on throughout the semester.		•Find and evaluate finite and infinite limits graphically, numerically, and analytically. •Find derivatives using a variety of methods including the Chain Rule and implicit differentiation. •Find extrema and apply Rolle's Theorem and the Mean Value Theorem. •Use the first derivative test and the second derivative test to analyze and sketch functions. •Find antiderivatives using a variety of methods including substitution. •Understand and apply Riemann sums, definite integrals, and The Fundamental Theorem of Calculus. •Evaluate integrals using a variety of methods including numerical integration. •Differentiate and integrate logarithmic, exponential, and inverse trigonometric functions. •Solve simple differential equations that can be solved by separation of variables. •Use simple differential equations that can be solved by separation of variables to solve applied problems. •Use integration to determine the area between two curves, volume, and surface area. •Apply integration to determine work, center of mass, and fluid force.
Unit 2: Limits and Their Properties In this unit you will learn how to calculate limits and explore their central role in calculus. You will study the notation, domain, and range of functions as well as the families, transformations, and compositions of functions. Throughout the unit you will apply what you learn to real-world situations. You will also continue to work on your research paper.	A.SSE.3; A.SSE.3A; A.CED.2; A.REI.4; F.IF.1; F.IF.2; F.IF.4; F.IF.6; F.IF.7; F.BF.1; F.BF.1C; F.BF.5;	•Graphs and Models •Rates of Change •Functions and Their Graphs •Finding Limits •Finding Limits Graphically and Numerically •Evaluating Limits Analytically •Continuity and One-Sided Limits •Infinite Limits

Unit 3: Differentiation In this unit you will learn how to calculate derivatives, one of the two major tools of calculus. You will study the rules of differentiation, explore the connection between differentiability and continuity, use derivatives to find rates of change, distinguish between functions written in implicit and explicit form, and apply related rates to solve real-world problems. Also, you will continue to work on your research paper.	F.BF.1a; F.LE.1B	•The Tangent Line Problem •Basic Differentiation Rules Quiz •Product and Quotient Rules •The Chain Rule Quiz •Assignment: Position, Velocity, and Acceleration Portfolio Item •Implicit Differentiation •Related Rates
Unit 4: Applications of Differentiation In this unit, you will learn the fundamental applications of differentiation using the first and second derivatives. You will find extrema over closed intervals, sketch and analyze the graph of a function, solve applied minimum and maximum problems, and use a tangent line approximation. In addition, you will apply several tests and theorems including Rolle's Theorem, the Mean Value Theorem, and the First and Second Derivative tests. You will complete your research paper by the end of this unit.	F.IF.4	•Extrema on an Interval •Rolle's and the Mean Value Theorems Quiz •Increasing and Decreasing Functions •Concavity and the Second Derivative Test •A Summary of Curve Sketching Quiz •Optimization •Newton's Method •Differentials
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 semester. Since this is a comprehensive exam, it may be helpful to organize your notes and answers to questions before you begin to review.		•Students demonstrate their knowledge of the concepts covered in this course