AVENTA LEARNING

Alignment Document
State of Montana and Aventa Learning Calculus

Calculus

Standards	Benchmarks	Unit Name	Course Topic Description
1 Students engage in the mathematical processes of problem solving and reasoning, estimation, communication, connections and applications, and using appropriate technology.	**1.1** recognize and formulate problems from situations within and outside mathematics and apply solution strategies to those problems.	Limits and Their Properties	Linear Models and Rates of Change
		Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Differentiation	Implicit Differentiation
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Integration	Area, Reimann Sums, and Definite Integrals
		Logarithmic, Exponential, and Other Transcendental Function	Inverse Functions and Exponential Functions
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
		Differential Equations	Separation of Variables and First Order Linear Differential Equations
		Applications of Integration	Area of a Region Between Two Curves
		Applications of Integration	Volumes, Arc Lengths, and Surfaces
		Applications of Integration	Work, Moments, and Fluids

	1.2 select, apply, and evaluate appropriate estimation strategies throughout the problem-solving process.	Limits and Their Properties	Functions, Graphs of Functions and Finding Models to Data
		Limits and Their Properties	Finding Limits Graphically, Numerically and Analytically
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Integration	Integration by Substitution and Numerical Integration
	1.3 formulate definitions, make and justify inferences, express generalizations, and communicate mathematical ideas and relationships.	Covered throughout the course	
	1.4 apply and translate among different representations of the same problem situation or of the same mathematical concept. Model connections between problem situations that arise in disciplines other than mathematics.	Limits and Their Properties	Finding Limits Graphically, Numerically and Analytically
		Differentiation	The Derivative
		Differentiation	Differentiation
		Differentiation	Implicit Differentiation
		Applications of Differentiation	Extrema and the Mean Value Theorem
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Integration	The Fundamental Theorem of Calculus
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay

		Differential Equations	Separation of Variables and First Order Linear Differential Equations
		Applications of Integration	Area of a Region Between Two Curves
		Applications of Integration	Volumes, Arc Lengths, and Surfaces
		Applications of Integration	Work, Moments, and Fluids
	1.5 select and use appropriate technology to enhance mathematical understanding. Appropriate technology may include, but is not limited to, paper and pencil, calculator, computer, and data collection devices.	Covered throughout the course	
2 Students demonstrate understanding of and an ability to use numbers and operations.	**2.1** use and understand the real number system, its operations, notations, and the various subsystems.	Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Limits and Their Properties	Continuity, One-Sided Limits, and Infinite Limits
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Logarithmic, Exponential, and Other Transcendental Functions	The Natural Logarithmic Function
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Trigonometric Functions
	2.2 use definitions and basic operations of the complex number system.		
3 Students use algebraic concepts, processes, and language to model and solve a variety of real-world and mathematical problems.	**3.1** use algebra to represent patterns of change.	Limits and Their Properties	Linear Models and Rates of Change
		Differentiation	The Derivative
		Differentiation	Implicit Differentiation

		Applications of Differentiation	Extrema and the Mean Value Theorem
		Applications of Differentiation	Derivative Tests, Limits, and Graphs
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Integration	Area, Reimann Sums, and Definite Integrals
		Integration	Integration by Substitution and Numerical Integration
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
	3.2 use basic operations with algebraic expressions.	Covered throughout the course	
	3.3 solve algebraic equations and inequalities: linear, quadratic, exponential, logarithmic, and power.	Differentiation	Differentiation
		Differentiation	Implicit Differentiation
		Applications of Differentiation	Extrema and the Mean Value Theorem
		Application of Differentiation	Derivative Tests, Limits, and Graphs
		Application of Differentiation	Optimization, Newton's Method, and Differentials
		Logarithmic, Exponential, and Other Transcendental Functions	The Natural Logarithmic Function
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Differential Equations	Separation of Variables and First Order Linear Differential Equations
	3.4 solve systems of algebraic equations and inequalities, including use of matrices.		

	3.5 use algebraic models to solve mathematical and real-world problems.	Limits and Their Properties	Linear Models and Rates of Change
		Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Differentiation	Differentiation
		Differentiation	Implicit Differentiation
		Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Integration	Area, Reimann Sums, and Definite Integrals
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
		Differential Equations	Separation of Variables and First Order Linear Differential Equations
		Applications of Integration	Area of a Region Between Two Curves
		Applications of Integration	Volumes, Arc Lengths, and Surfaces
		Applications of Integration	Work, Moments, and Fluids
4 Students demonstrate understanding of shape and an ability to use geometry.	**4.1** construct, interpret, and draw three-dimensional objects.		
	4.2 classify figures in terms of congruence and similarity and apply these relationships.		
	4.3 translate between synthetic and coordinate representations.		
	4.4 deduce properties of figures using transformations, coordinates, and vectors in		

	problem solving.		
	4.5 apply trigonometric ratios (sine, cosine and tangent) to problem situations involving triangles.	Differentiation Logarithmic, Exponential, and Other Transcendental Functions	Implicit Differentiation Inverse Trigonometric Functions
5 Students demonstrate understanding of measurable attributes and an ability to use measurement processes.	**5.1** apply concepts of indirect measurements (e.g., using similar triangles to calculate a distance).	Differentiation	Implicit Differentiation
	5.2 use dimensional analysis to check reasonableness of procedures.	Differentiation Applications of Differentiation Applications of Integration	Implicit Differentiation Optimizations, Newton's Method, and Differentials Work, Moments, and Fluids
	5.3 investigate systems of derived measures (e.g., km/sec, g/cm³).	Differentiation Differentiation Applications of Integration	Differentiation Implicit Differentiation Work, Moments, and Fluids
	5.4 apply the appropriate concepts of estimates in measurement, error in measurement, tolerance, and precision.	Applications of Differentiation Integration Integration Differential Equations	Optimization, Newton's Method, and Differentials Area, Reimann Sums, and Definite Integrals Integration by Substitution and Numerical Integration Slope Fields, Euler's Method, and Growth and Decay
6 The students demonstrate understanding of and an ability to use data analysis, probability, and statistics.	**6.1** use curve fitting to make predictions from data.	Limits and Their Properties Limits and Their Properties	Linear Models and Rates of Change Functions, Graphs of Functions, and Finding Models to Data
	6.2 apply measures of central tendency and demonstrate understanding of the concepts of variability and correlation.		

	6.3 select an appropriate sampling method for a given statistical analysis.		
	6.4 use experimental probability, theoretical probability, and simulation methods to represent and solve problems, including expected values.		
	6.5 design a statistical experiment to study a problem and communicate the outcomes.		
	6.6 describe, in general terms, the normal curve and use its properties to answer questions about sets of data that are assumed to be normally distributed.		
7 Students demonstrate understanding of and an ability to use patterns, relations and functions.	**7.1** describe functions and their inverses using graphical, numerical, physical, algebraic, and verbal mathematical models or representations.	Limits and Their Properties Limits and Their Properties Applications of Differentiation Applications of Differentiation Integration Integration Logarithmic, Exponential, and Other Transcendental Functions Logarithmic, Exponential, and Other Transcendental Functions Logarithmic, Exponential, and Other Transcendental Functions Logarithmic, Exponential, and Other Transcendental Functions	Linear Models and Rates of Change Functions, Graphs of Functions, and Finding Models to Data Extrema and the Mean Value Theorem Derivative Tests, Limits, and Graphs Antiderivatives and Indefinite Integration Fundamental Theorem of Calculus The Natural Logarithmic Function Inverse Functions and Exponential Functions Inverse Trigonometric Functions Hyperbolic Functions

		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
	7.2 analyze the graphs of the families of polynomial, rational, power, exponential, logarithmic, and periodic functions.	Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Applications of Differentiation	Extrema and the Mean Value Theorem
		Applications of Differentiation	Derivative Tests, Limits, and Graphs
		Logarithmic, Exponential, and Other Transcendental Functions	The Natural Logarithmic Functions
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
	7.3 analyze the effects of parameter changes on the graphs of functions and relations, including translations.	Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Applications of Differentiation	Optimizations, Newton's Method, and Differentials
	7.4 model real-world phenomena with a variety of functions.	Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
		Differentiation	Differentiation
		Differentiation	Implicit Differentiation
		Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
		Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
		Differential Equations	Separation of Variables and First Order Linear Differential Equations

		Applications of Integration	Work, Moments, and Fluids
	7.5 use graphing for parametric equations, three-dimensional equations, and recursive relations.	Applications of Differentiation	Optimization, Newton's Method, and Differentials
		Differential Equations	Slope Fields, Euler's Method, and Exponential Growth and Decay