Calculus

State Goals	Learning Standards	Benchmarks	Unit Name	Course Topic Description
6 Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios and proportions.	**6.A** Demonstrate knowledge and use of numbers and their representations in a broad range of theoretical and practical settings.	**6.A.5** Perform addition, subtraction and multiplication of complex numbers and graph the results in the complex plane.		
	6.B Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships.	**6.B.5** Identify, represent and apply numbers expressed in exponential, logarithmic and scientific notation using contemporary technology.	Logarithmic, Exponential, and Other Transcendental Functions	The Natural Logarithmic Function
				Inverse Functions and Exponential Functions
	6.C Compute and estimate using mental mathematics, paper-and-pencil methods, calculators and computers.	**6.C.5** Determine the level of accuracy needed for computations involving measurement and irrational numbers.		
	6.D Solve problems using comparison of quantities, ratios, proportions and percents.	**6.D.5** Solve problems involving loans, mortgages and other practical applications involving geometric patterns of growth.	Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
			Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
7 Estimate, make and use measurements of objects, quantities and relationships	**7.A** Measure and compare quantities using appropriate units, instruments and methods.	**7.A.5** Apply nonlinear scales (e.g., Richter, decibel, pH) to solve practical problems.		
	7.B Estimate	**7.B.5** Estimate perimeter, area, volume, and capacity of	Integration	Area, Riemann Sums, and

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and determine acceptable levels of accuracy.	measurements and determine acceptable levels of accuracy.	irregular shapes, regions and solids and explain the reasoning supporting the estimate.	Integration	Definite Integrals
				Integration by Substitution and Numerical Integration
	7.C Select and use appropriate technology, instruments and formulas to solve problems, interpret results and communicate findings.	**7.C.5a** Use dimensional analysis to determine units and check answers in applied measurement problems.		
		7.C.5b Determine how changes in one measure may affect other measures (e.g., what happens to the volume and surface area of a cube when the side of the cube is halved).	Differentiation	Differentiation
				Implicit Differentiation Optimization, Newton's
			Applications of Differentiation	Method, and Differentials
8 Use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems and predict results.	**8.A** Describe numerical relationships using variables and patterns.	**8.A.5** Solve mathematical problems involving recursive patterns and use models that employ such relationships.	Applications of Differentiation	Optimization, Newton's Method, and Differentials
			Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
	8.B Interpret and describe numerical relationships using tables, graphs and symbols.	**8.B.5** Use functions including exponential, polynomial, rational, parametric, logarithmic, and trigonometric to describe numerical relationships.	Limits and Their Properties	Linear Models and Rates of Change
				Functions, Graphs of Functions, and Finding Models to Data
			Applications of Differentiation	Derivative Tests, Limits, and Graphs
			Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
	8.C Solve problems using systems of numbers and their properties.	**8.C.5** Use polynomial, exponential, logarithmic and trigonometric functions to model situations.	Limits and Their Properties	Linear Models and Rates of Change
				Functions, Graphs of Functions, and Finding Models to Data
			Differentiation	Differentiation

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			Applications of Differentiation	Derivative Tests, Limits, and Graphs
			Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
			Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
				Separation of Variables and First Order Linear Differential Equations
	8.D Use algebraic concepts and procedures to represent and solve problems.	**8.D.5** Formulate and solve nonlinear equations and systems including problems involving inverse variation and exponential and logarithmic growth and decay.	Applications of Differentiation	Derivative Tests, Limits, and Graphs
			Logarithmic, Exponential, and Other Transcendental Functions	The Natural Logarithmic Function
				Inverse Functions and Exponential Functions
				Inverse Trigonometric Functions
			Differential Equations	Slope Fields, Euler's Method, and Growth and Decay
				Separation of Variables and First Order Linear Differential Equations
9 Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes	**9.A** Demonstrate and apply geometric concepts involving points, lines, planes and space.	**9.A.5** Use geometric figures and their properties to solve problems in the arts, the physical and life sciences and the building trades, with and without the use of technology.	Differentiation	Implicit Differentiation
			Applications of Differentiation	Optimization, Newton's Method, and Differentials
			Applications of Integration	Volumes, Arc Lengths, and Surfaces
				Work, Moments, and Fluids
	9.B Identify, describe,	**9.B.5** Construct and use two- and three-dimensional		

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and space.	classify and compare relationships using points, lines, planes and solids.	models of objects that have practical applications (e.g., blueprints, topographical maps, scale models).		
	9.C Construct convincing arguments and proofs to solve problems.	**9.C.5a** Perform and describe an original investigation of a geometric problem and verify the analysis and conclusions to an audience.	Applications of Differentiation	Optimization, Newton's Method, and Differentials
		9.C.5b Apply physical models, graphs, coordinate systems, networks and vectors to develop solutions in applied contexts (e.g., bus routing, areas of irregular shapes, describing forces and other physical quantities).	Limits and Their Properties	Linear Models and Rates of Change
				Functions, Graphs of Functions, and Finding Models to Data
			Differentiation	Implicit Differentiation
			Applications of Differentiatio	Optimization, Newton's Method, and Differentials
			Logarithmic, Exponential, and Other Transcendental Functions	Inverse Functions and Exponential Functions
			Applications of Integration	Volumes
				Work
	9.D Use trigonometric ratios and circular functions to solve problems.	**9.D.5** Analyze and solve problems involving periodic patterns (e.g., sound waves, tide variations) using circular functions and communicate results orally and in writing.	Limits and Their Properties	Functions, Graphs of Functions, and Finding Models to Data
			Applications of Differentiation	Derivative Tests, Limits, and Graphs
			Logarithmic, Exponential, and Other Transcendental Functions	Inverse Trigonometric Functions
10 Collect, organize and analyze data using	**10.A** Organize, describe and make predictions from existing data.	**10.A.5** Construct a statistics-based presentation, individually and as members of a team, to communicate and justify the results of a project.		

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statistical methods; predict results; and interpret uncertainty using concepts of probability.	**10.B** Formulate questions, design data collection methods, gather and analyze data and communicate findings.	**10.B.5** Design a statistical experiment to answer a question about a realistic situation, conduct the experiment, use statistics to interpret the data, and communicate the results, individually and as members of a team.		
	10.C Determine, describe and apply the probabilities of events.	**10.C.5a** Compute conditional probabilities and the probabilities of independent events.		
		10.C.5b Compute probabilities in counting situations involving permutations and combinations.		
		10.C.5c Make predictions using probabilities associated with normally distributed events.		