

Calculus

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
9.A	Problem Solving, Reasoning, Estimation		
9.A.1	Solves problems including:		
9.A.1.a	Selecting appropriate approaches and tools.	Throughout Course	Throughout Course
9.A.1.b	Using estimating strategies to predict computational results.		
9.A.1.c	Judging reasonableness of results	Throughout Course	Throughout Course
9.A.2	Solves problems that relate concepts to practical applications and to other concepts using appropriate tools.	Throughout Course	Throughout Course
9.B	Functions		
9.B.3	Identifies the characteristics of functions and relations with respect to domain, range, intercepts, symmetries (including odd and even functions), asymptotes, and zeros.	Limits and Continuity Graph Behavior	Throughout units
9.B.3.a	Graphs functions and relations with respect to these characteristics and identifies these characteristics from graphs.	Graph Behavior	Throughout unit
9.B.4	Applies the algebra of functions by finding sum, product, quotient, composition, and inverse where they exist.		
9.B.5	Identifies and applies properties of algebraic, trigonometric, exponential, and logarithmic functions. Includes the following: polynomial (existence, number, and		

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	location of zeros), trigonometric (fundamental identities, addition formulas, graphs, amplitude, periodicity), exponential, logarithmic (properties, graphs, inverse, the number e as a limit), absolute value ($f(x)$, $ f(x) $), and bounded/ unbounded behavior.		
9.C	Limits and Continuity		
9.C.6	Evaluates limits of functions and applies properties of limits, including one-sided limits.	Limits and Continuity	Concept of a Limit
9.C.7	Estimates limits from graphs or tables of data.	Limits and Continuity	Throughout unit
9.C.8	Describes asymptotic behavior in terms of limits involving infinity.	Limits and Continuity	Limits Involving Infinity
9.C.9	Applies the definition of continuity to a function at a point. Determines if a function is continuous over an interval.	Limits and Continuity	Continuity
9.D	Derivatives		

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9.D.10	Defines the derivative of a function in various ways:		
9.D.10.a	The limit of the difference quotient.		
9.D.10.b	The slope of the tangent line at a point.	Derivatives	Concept of a Derivative
9.D.10.c	Instantaneous rate of change.	Derivative Applications	Rates of Change
9.D.10.d	The limit of the average rate of change.	Derivative Applications	Rate of Change
9.D.11	Determines if a function is differentiable over an interval.	Derivatives	Differentiability
9.D.11.a	Determine points where the derivative of a function fails to exist.	Derivatives	Differentiability
9.D.12	Applies the rules of differentiation to algebraic and transcendental functions.	Differentiation	Throughout unit

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9.D.13	Applies the chain rule to composite functions, implicitly defined functions, and related-rates of change.	Differentiation Derivative Applications	Product, Quotient, and Chain Rules Rates of Change
9.D.14	Approximates the rate of change at a point, given the graph of a function or a table of values.	Derivative Applications	Rates of Change
9.D.15	Differentiates the inverse of a function, including inverse trigonometric functions.	Differentiation	Derivatives of Inverse Functions
9.D.16	Determines successive derivatives of functions and applies them to problems, such as speed, velocity, and acceleration.	Derivatives Derivative Applications	Motion Along a Line Related Rates
9.D.17	Applies Rolle's Theorem and the Mean Value Theorem.	Derivative Applications	Mean Value and Rolle's Theorems Quiz
9.D.18	Applies L'Hopital's Rule when appropriate.		
9.E	Applications of the Derivative		
9.E.19	Applies the derivative to determine:		

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9.E.19.a	the slope of a curve at a point,	Derivatives	Slope of a Curve at a Point
9.E.19.b	the equation of the tangent line to a curve at a point,	Derivatives	Tangent Line Approximation
9.E.19.c	the equation of the normal line to a curve at a point.		
9.E.20	Uses the relationships between $f(x)$, $f'(x)$, $f''(x)$ to:		
9.E.20.a	Determine the increasing/decreasing behavior of $f(x)$.	Graph Behavior	Increasing/Decreasing Behavior and Concavity
9.E.20.b	Determine critical point(s) of $f(x)$.	Graph Behavior	Critical Points
9.E.20.c	Determine the concavity of $f(x)$ over an interval.	Graph Behavior	Increasing/Decreasing Behavior and Concavity
9.E.20.d	Determine the point(s) of inflection of $f(x)$.	Graph Behavior	Relative Extreme Values and Points of Inflection

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9.E.20.e	Sketch the graphs of $f'(x)$ and $f''(x)$, given $f(x)$.	Derivatives	Graphs of f and f'
9.E.20.f	Sketch the graph of $f(x)$, given $f'(x)$.	Derivatives	Graphs of f and f'
9.E.21	Applies the extreme value theorem to problem situations.	Graph Behavior	Absolute Extreme Values and Externe Value Theorem
9.E.22	Solves optimization problems.	Derivative Applications	Optimization
9.F	Integrals		
9.F.22	Defines the antiderivative and applies its properties to problems such as distance and velocity from acceleration with initial conditions, growth, and decay.	Differential Equations and Their Applications Derivatives	Growth and Decay Models Motion Along a Line
9.F.24	Approximates areas by using inscribed rectangles, circumscribed rectangles, trapezoids, and other appropriate methods.	The Definite Integral	Area and Riemann Sums
9.F.25	Calculates areas by evaluating sums using sigma notation.	The Definite Integral	Area and Riemann Sums

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9.F.26	Relates the definite integral to the concept of the area under a curve.	The Definite Integral	Area and Riemann Sums
9.F.26.a	Defines and applies the properties of the definite integral.	The Definite Integral	Throughout unit
9.F.27	Identifies and uses the Fundamental Theorem of Calculus in evaluating definite integrals.	The Definite Integral	Fundamental Theorem of Calculus
9.F.29	Integrates by substitution, by using identities, by changing variables, and by parts.	Antidifferentiation	Substitution Rule
9.G	Application of the Integral		
9.G.29	Applies the integral to the average or mean value of a function on an interval.	Integral Applications	Average Value of a Function
9.G.30	Determines the area between curves using integration formulas.	Area and Volume	Area Between Two Curves
9.G.31	Determines the volume of a solid of revolution using various methods.	Area and Volume	Volume of Solids of Revolution

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9.G.32	Interprets $\ln x$ as the area under the curve of $f(x) = 1/x$.	The Definite Integral	Area and Riemann Sums
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