Correlation of Learning Objectives from the AP® Calculus Curriculum Framework to *Calculus for AP®*

AP® Calculus Concept	Correlation of Concepts to *Calculus for AP®*
Big Idea 1: Limits **Enduring Understanding 1.1:** The concept of a limit can be used to understand the behavior of functions. **Learning Objective 1.1A(a):** Express limits symbolically using correct notation.	Chap 2, Sec 2.1, 2.2, 2.4
Learning Objective 1.1A(b): Interpret limits expressed symbolically.	Chap 2, Sec 2.2, 2.4
Learning Objective 1.1B: Estimate limits of functions.	Chap 2, Sec 2.1, 2.2, 2.3
Learning Objective 1.1C: Determine limits of functions.	Chap 2, Sec 2.2, 2.3 Chap 3, Sec 3.5 Chap 4, Sec 4.4 Chap 5, Sec 5.4 Chap 9, Sec 9.1
Learning Objective 1.1D: Deduce and interpret behavior of functions using limits.	Chap 2, Sec 2.4 Chap 9, Sec 9.1
Enduring Understanding 1.2: Continuity is a key property of functions that is defined using limits. **Learning Objective 1.2A:** Analyze functions for intervals of continuity or points of discontinuity.	Chap 2, Sec 2.5
Learning Objective 1.2B: Determine the applicability of important calculus theorems using continuity.	Chap 2, Sec 2.5 Chap 4, Sec 4.1, 4.2
Big Idea 2: Derivatives **Enduring Understanding 2.1:** The derivative of a function is defined as the limit of a difference quotient and can be determined using a variety of strategies. **Learning Objective 2.1A:** Identify the derivative of a function as the limit of a difference quotient.	Chap 3, Sec 3.1, 3.2, 3.9 Chap 5, Sec 5.4
Learning Objective 2.1B: Estimate derivatives.	Chap 3, Sec 3.2, 3.3
Learning Objective 2.1C: Calculate derivatives.	Chap 3, Sec 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8 Chap 9, Sec 9.9 Chap 10, Sec 10.2, 10.3

AP® Calculus Concept	Correlation of Concepts to *Calculus for AP®*
Learning Objective 2.1D: Determine higher order derivatives.	Chap 3, Sec 3.2
Enduring Understanding 2.2: A function's derivative, which is itself a function, can be used to understand the behavior of the function. **Learning Objective 2.2A:** Use derivatives to analyze properties of a function.	Chap 3, Sec 3.2, 3.4 Chap 4, Sec 4.1, 4.2, 4.3, 4.5 Chap 5, Sec 5.1, 5.6 Chap 6, Sec 6.3 Chap 7, Sec 7.1 Chap 9, Sec 9.1, 9.5 Chap 10, Sec 10.3
Learning Objective 2.2B: Recognize the connection between differentiability and continuity.	Chap 3, Sec 3.2
Enduring Understanding 2.3: The derivative has multiple interpretations and applications, including those that involve instantaneous rates of change. **Learning Objective 2.3A:** Interpret the meaning of a derivative within a problem.	Chap 3, Sec 3.9, 3.10 Chap 4, Sec 4.1
Learning Objective 2.3B: Solve problems involving the slope of a tangent line.	Chap 3, Sec 3.1, 3.11 Chap 6, Sec 6.3 Chap 8, Sec 8.1
Learning Objective 2.3C: Solve problems involving related rates, optimization, rectilinear motion, (BC) and planar motion.	Chap 3, Sec 3.9, 3.10 Chap 4, Sec 4.6 Chap 6, Sec 6.3, 6.4 Chap 7, Sec 7.1 Chap 10, Sec 10.2
Learning Objective 2.3D: Solve problems involving rates of change in applied contexts.	Chap 3, Sec 3.9
Learning Objective 2.3E: Verify solutions to differential equations.	Chap 8, Sec 8.1, 8.2
Learning Objective 2.3F: Estimate solutions to differential equations.	Chap 8, Sec 8.1, 8.2, 8.3
Enduring Understanding 2.4: The Mean Value Theorem connects the behavior of a differentiable function over an interval to the behavior of the derivative of that function at a particular point in the interval. **Learning Objective 2.4A:** Apply the Mean Value Theorem to describe the behavior of a function over an interval.	Chap 4, Sec 4.2, 4.3
Big Idea 3: Integrals and the Fundamental Theorem of Calculus **Enduring Understanding 3.1:** Antidifferentiation is the inverse process of differentiation. **Learning Objective 3.1A:** Recognize antiderivatives of basic functions.	Chap 5, Sec 5.1, 5.5, 5.6 Chap 7, Sec 7.1, 7.4, 7.5, 7.6
Enduring Understanding 3.2: The definite integral of a function over an interval is the limit of a Riemann sum over that interval and can be calculated using a variety of strategies. **Learning Objective 3.2A (a):** Interpret the definite integral as the limit of a Riemann sum.	Chap 5, Sec 5.3 Chap 6, Sec 6.1, 6.2
Learning Objective 3.2A (b): Express the limit of a Riemann sum in integral notation.	Chap 5, Sec 5.3 Chap 6, Sec 6.1, 6.2, 6.5, 6.6

AP® Calculus Concept	Correlation of Concepts to *Calculus for AP®*
Learning Objective 3.2B: Approximate a definite integral.	Chap 6, Sec 6.3, 6.4
Learning Objective 3.2C: Calculate a definite integral using areas and properties of definite integrals.	Chap 5, Sec 5.3 Chap 6, Sec 6.3, 6.4
Learning Objective 3.2D: (BC) Evaluate an improper integral or show that an improper integral diverges.	Chap 7, Sec 7.6
Enduring Understanding 3.3: The Fundamental Theorem of Calculus, which has two distinct formulations, connects differentiation and integration. **Learning Objective 3.3A:** Analyze functions defined by an integral.	 Chap 5, Sec 5.4 Chap 6, Sec 6.3, 6.6
Learning Objective 3.3B (a): Calculate antiderivatives.	Chap 5, Sec 5.4, 5.5 Chap 6, Sec 6.3, 6.5 Chap 7, Sec 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 Chap 9, Sec 9.10
Learning Objective 3.3B (b): Evaluate definite integrals.	Chap 5, Sec 5.4, 5.5, 5.6 Chap 6, Sec 6.1, 6.4, 6.5, 6.6 Chap 7, Sec 7.3, 7.4, 7.5, 7.6 Chap 9, Sec 9.10
Enduring Understanding 3.4: The definite integral of a function over an interval is a mathematical tool with many interpretations and applications involving accumulation. **Learning Objective 3.4A:** Interpret the meaning of a definite integral within a problem.	 Chap 5, Sec 5.3, 5.5 Chap 6, Sec 6.3, 6.4
Learning Objective 3.4B: Apply definite integrals to problems involving the average value of a function.	Chap 6, Sec 6.2, 6.3, 6.4
Learning Objective 3.4C: Apply definite integrals to problems involving motion.	Chap 5, Sec 5.5 Chap 6, Sec 6.1, 6.4 Chap 10, Sec 10.2
Learning Objective 3.4D: Apply definite integrals to problems involving area, volume, (BC) and length of a curve.	Chap 6, Sec 6.1, 6.5, 6.6 Chap 10, Sec 10.2, 10.4
Learning Objective 3.4E: Use the definite integral to solve problems in various contexts.	Chap 5, Sec 5.5 Chap 6, Sec 6.1, 6.3
Enduring Understanding 3.5: Antidifferentiation is an underlying concept involved in solving separable differential equations. Solving separable differential equations involves determining a function or relation given its rate of change. **Learning Objective 3.5A:** Analyze differential equations to obtain general and specific solutions.	 Chap 5, Sec 5.1 Chap 8, Sec 8.2, 8.3
Learning Objective 3.5B: Interpret, create, and solve differential equations from problems in context.	Chap 8, Sec 8.3
Big Idea 4: Series (BC) **Enduring Understanding 4.1:** The sum of an infinite number of real numbers may converge. **Learning Objective 4.1A:** Determine whether a series converges or diverges.	 Chap 9, Sec 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10

AP® Calculus Concept	Correlation of Concepts to *Calculus for AP®*
Learning Objective 4.1B: Determine or estimate the sum of a series.	Chap 9, Sec 9.5, 9.6, 9.7, 9.8, 9.9
Enduring Understanding 4.2: A function can be represented by an associated power series over the interval of convergence for the power series. **Learning Objective 4.2A:** Construct and use Taylor polynomials.	 Chap 9, Sec 9.9, 9.10
Learning Objective 4.2B: Write a power series representing a given function.	Chap 9, Sec 9.8, 9.9, 9.10
Learning Objective 4.2C: Determine the radius and interval of convergence of a power series.	Chap 9, Sec 9.8, 9.9, 9.10

Correlation of Essential Knowledge Statements from the AP® Calculus Curriculum Framework to *Calculus for AP®*

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Big Idea 1: Limits	
Essential Knowledge 1.1A1: Given a function f, the limit of $f(x)$ as x approaches c is a real number R if $f(x)$ can be made arbitrarily close to R by taking x sufficiently close to c (but not equal to c). If the limit exists and is a real number, then the common notation is $\lim\limits_{x \to c} f(x) = R$.	Chap 2, Sec 2.1, 2.2, 2.6
Essential Knowledge 1.1A2: The concept of a limit can be extended to include one-sided limits, limits at infinity, and infinite limits.	Chap 2, Sec 2.2, 2.4, 2.6
Essential Knowledge 1.1A3: A limit might not exist for some functions at particular values of x. Some ways that the limit might not exist are if the function is unbounded, if the function is oscillating near this value, or if the limit from the left does not equal the limit from the right.	Chap 2, Sec 2.2
Essential Knowledge 1.1B1: Numerical and graphical information can be used to estimate limits.	Chap 2, Sec 2.1, 2.2
Essential Knowledge 1.1C1: Limits of sums, differences, products, quotients, and composite functions can be found using the basic theorems of limits and algebraic rules.	Chap 2, Sec 2.3
Essential Knowledge 1.1C2: The limit of a function may be found by using algebraic manipulation, alternate forms of trigonometric functions, or the Squeeze Theorem.	Chap 2, Sec 2.2, 2.3 Chap 3, Sec 3.5 Chap 5, Sec 5.4
Essential Knowledge 1.1C3: Limits of the indeterminate forms $\frac{0}{0}$ and $\frac{\infty}{\infty}$ may be evaluated using L'Hospital's Rule.	Chap 4, Sec 4.4 Chap 9, Sec 9.1
Essential Knowledge 1.1D1: Asymptotic and unbounded behavior of functions can be explained and described using limits.	Chap 2, Sec 2.4 Chap 9, Sec 9.1
Essential Knowledge 1.1D2: Relative magnitudes of functions and their rates of change can be compared using limits.	Chap 2, Sec 2.4
Essential Knowledge 1.2A1: A function f is continuous at $x = c$ provided that $f(c)$ exists, $\lim\limits_{x \to c} f(x)$ exists, and $\lim\limits_{x \to c} f(x) = f(c)$.	Chap 2, Sec 2.5
Essential Knowledge 1.2A2: Polynomial, rational, power, exponential, logarithmic, and trigonometric functions are continuous at all points in their domains.	Chap 2, Sec 2.5

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 1.2A3: Types of discontinuities include removable discontinuities, jump discontinuities, and discontinuities due to vertical asymptotes.	Chap 2, Sec 2.5
Essential Knowledge 1.2B1: Continuity is an essential condition for theorems such as the Intermediate Value Theorem, the Extreme Value Theorem, and the Mean Value Theorem.	Chap 2, Sec 2.5 Chap 4, Sec 4.1, 4.2
Big Idea 2: Derivatives **Essential Knowledge 2.1A1:** The difference quotients $\frac{f(a+h)-f(a)}{h}$ and $\frac{f(x)-f(a)}{x-a}$ express the average rate of change of a function over an interval.	Chap 3, Sec 3.1, 3.9
Essential Knowledge 2.1A2: The instantaneous rate of change of a function at a point can be expressed by $\lim\limits_{h\to 0}\frac{f(a+h)-f(a)}{h}$ or $\lim\limits_{x\to a}\frac{f(x)-f(a)}{x-a}$, provided that the limit exists. These are common forms of the definition of the derivative and are denoted $f'(a)$.	Chap 3, Sec 3.1
Essential Knowledge 2.1A3: The derivative of f is the function whose value at x is $\lim\limits_{h\to 0}\frac{f(x+h)-f(x)}{h}$ provided this limit exists.	Chap 3, Sec 3.2 Chap 5, Sec 5.4
Essential Knowledge 2.1A4: For $y=f(x)$, notations for the derivative include $\frac{dy}{dx}$, $f'(x)$, and y'.	Chap 3, Sec 3.2
Essential Knowledge 2.1A5: The derivative can be represented graphically, numerically, analytically, and verbally.	Chap 3, Sec 3.1, 3.2, 3.9
Essential Knowledge 2.1B1: The derivative at a point can be estimated from information given in tables or graphs.	Chap 3, Sec 3.2, 3.3
Essential Knowledge 2.1C1: Direct application of the definition of the derivative can be used to find the derivative for selected functions, including polynomial, power, sine, cosine, exponential, and logarithmic functions.	Chap 3, Sec 3.2 Chap 9, Sec 9.9
Essential Knowledge 2.1C2: Specific rules can be used to calculate derivatives for classes of functions, including polynomial, rational, power, exponential, logarithmic, trigonometric, and inverse trigonometric.	Chap 3, Sec 3.3, 3.5, 3.6, 3.7, 3.8
Essential Knowledge 2.1C3: Sums, differences, products, and quotients of functions can be differentiated using derivative rules.	Chap 3, Sec 3.4
Essential Knowledge 2.1C4: The chain rule provides a way to differentiate composite functions.	Chap 3, Sec 3.6
Essential Knowledge 2.1C5: The chain rule is the basis for implicit differentiation.	Chap 3, Sec 3.7
Essential Knowledge 2.1C6: The chain rule can be used to find the derivative of an inverse function, provided the derivative of that function exists.	Chap 3, Sec 3.7
Essential Knowledge 2.1C7: (BC) Methods for calculating derivatives of real-valued functions can be extended to vector-valued functions, parametric functions, and functions in polar coordinates.	Chap 10, Sec 10.2, 10.3
Essential Knowledge 2.1D1: Differentiating f' produces the second derivative f'', provided the derivative of f' exists; repeating this process produces higher order derivatives of f.	Chap 3, Sec 3.2

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 2.1D2: Higher order derivatives are represented with a variety of notations. For $y = f(x)$, notations for the second derivative include $\frac{d^2y}{dx^2}$, $f''(x)$, and y''. Higher order derivatives can be denoted $\frac{d^ny}{dx^n}$ or $f^{(n)}(x)$.	Chap 3, Sec 3.2
Essential Knowledge 2.2A1: First and second derivatives of a function can provide information about the function and its graph, including intervals of increase or decrease, local (relative) and global (absolute) extrema, intervals of upward or downward concavity, and points of inflection.	Chap 4, Sec 4.1, 4.5 Chap 5, Sec 5.1, 5.6 Chap 6, Sec 6.3 Chap 7, Sec 7.1 Chap 9, Sec 9.1, 9.5
Essential Knowledge 2.2A2: Key features of functions and their derivatives can be identified and related to their graphical, numerical, and analytical representations.	Chap 4, Sec 4.1, 4.2, 4.3, 4.5 Chap 5, Sec 5.1, 5.6 Chap 6, Sec 6.3 Chap 7, Sec 7.1
Essential Knowledge 2.2A3: Key features of the graphs of f, f', and f'' are related to one another.	Chap 3, Sec 3.2, 3.4 Chap 4, Sec 4.1, 4.3, 4.5 Chap 6, Sec 6.3 Chap 7, Sec 7.1
Essential Knowledge 2.2A4: (BC) For a curve given by a polar equation $r = f(\theta)$, derivatives of r, x, and y with respect to θ and first and second derivatives of y with respect to x can provide information about the curve.	Chap 10, Sec 10.3
Essential Knowledge 2.2B1: A continuous function may fail to be differentiable at a point in its domain.	Chap 3, Sec 3.2
Essential Knowledge 2.2B2: If a function is differentiable at a point, then it is continuous at that point.	Chap 3, Sec 3.2
Essential Knowledge 2.3A1: The unit for $f'(x)$ is the unit for f divided by the unit for x.	Chap 3, Sec 3.1, 3.9, 3.10 Chap 4, Sec 4.1
Essential Knowledge 2.3A2: The derivative of a function can be interpreted as the instantaneous rate of change with respect to its independent variable.	Chap 3, Sec 3.1, 3.9, 3.10
Essential Knowledge 2.3B1: The derivative at a point is the slope of the line tangent to a graph at that point on the graph.	Chap 2, Sec 2.1 Chap 3, Sec 3.11 Chap 6, Sec 6.3 Chap 8, Sec 8.1
Essential Knowledge 2.3B2: The tangent line is the graph of a locally linear approximation of the function near the point of tangency.	Chap 3, Sec 3.1, 3.11 Chap 8, Sec 8.1
Essential Knowledge 2.3C1: The derivative can be used to solve rectilinear motion problems involving position, speed, velocity, and acceleration.	Chap 3, Sec 3.9 Chap 6, Sec 6.4 Chap 7, Sec 7.1
Essential Knowledge 2.3C2: The derivative can be used to solve related rates problems, that is, finding a rate at which one quantity is changing by relating it to other quantities whose rates of change are known.	Chap 3, Sec 3.10
Essential Knowledge 2.3C3: The derivative can be used to solve optimization problems, that is, finding a maximum or minimum value of a function over a given interval.	Chap 4, Sec 4.1, 4.6 Chap 6, Sec 6.3

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 2.3C4: (BC) Derivatives can be used to determine velocity, speed, and acceleration for a particle moving along curves given by parametric or vector-valued functions.	Chap 10, Sec 10.2
Essential Knowledge 2.3D1: The derivative can be used to express information about rates of change in applied contexts.	Chap 3, Sec 3.9
Essential Knowledge 2.3E1: Solutions to differential equations are functions or families of functions.	Chap 8, Sec 8.1, 8.2
Essential Knowledge 2.3E2: Derivatives can be used to verify that a function is a solution to a given differential equation.	Chap 8, Sec 8.1, 8.2
Essential Knowledge 2.3F1: Slope fields provide visual clues to the behavior of solutions to first order differential equations.	Chap 8, Sec 8.1, 8.2, 8.3
Essential Knowledge 2.3F2: (BC) For differential equations, Euler's method provides a procedure for approximating a solution or a point on a solution curve.	Chap 8, Sec 8.1, 8.2, 8.3
Essential Knowledge 2.4A1: If a function f is continuous over the interval $[a, b]$ and differentiable over the interval (a, b), the Mean Value Theorem guarantees a point within that open interval where the instantaneous rate of change equals the average rate of change over the interval.	Chap 4, Sec 4.2
Big Idea 3: Integrals and the Fundamental Theorem of Calculus **Essential Knowledge 3.1A1:** An antiderivative of a function f is a function g whose derivative is f.	Chap 5, Sec 5.1, 5.5, 5.6 Chap 7, Sec 7.1, 7.2, 7.4, 7.5, 7.6
Essential Knowledge 3.1A2: Differentiation rules provide the foundation for finding antiderivatives.	Chap 5, Sec 5.1, 5.5, 5.6 Chap 7, Sec 7.1, 7.2, 7.4, 7.5, 7.6
Essential Knowledge 3.2A1: A Riemann sum, which requires a partition of an interval I, is the sum of products, each of which is the value of the function at a point in a subinterval multiplied by the length of that subinterval of the partition.	Chap 6, Sec 6.1, 6.2, 6.6
Essential Knowledge 3.2A2: The definite integral of a continuous function f over the interval $[a, b]$, denoted by $\int_a^b f(x)\,dx$, is the limit of Riemann sums as the widths of the subintervals approach 0. That is, $\int_a^b f(x)\,dx = \lim_{\max\Delta x_i \to 0} \sum_{i=1}^{n} f(x_i^*)\,\Delta x_i$, where x_i^* is a value in the ith subinterval, Δx_i is the width of the ith subinterval, n is the number of subintervals, and $\max\Delta x_i$ is the width of the largest subinterval. Another form of the definition is $\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{i=1}^{\infty} f(x_i^*)\,\Delta x_i$, where $\Delta x_i = \frac{b-a}{n}$ and x_i^* is a value in the ith subinterval.	Chap 5, Sec 5.3, 5.4 Chap 6, Sec 6.1, 6.2, 6.5, 6.6
Essential Knowledge 3.2A3: The information in a definite integral can be translated into the limit of a related Riemann sum, and the limit of a Riemann sum can be written as a definite integral.	Chap 5, Sec 5.3 Chap 6, Sec 6.2, 6.5, 6.6
Essential Knowledge 3.2B1: Definite integrals can be approximated for functions that are represented graphically, numerically, algebraically, and verbally.	Chap 5, Sec 5.2 Chap 6, Sec 6.3
Essential Knowledge 3.2B2: Definite integrals can be approximated using a left Riemann sum, a right Riemann sum, a midpoint Riemann sum, or a trapezoidal sum; approximations can be computed using either uniform or nonuniform partitions.	Chap 5, Sec 5.2 Chap 6, Sec 6.3, 6.4

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 3.2C1: In some cases, a definite integral can be evaluated by using geometry and the connection between the definite integral and area.	Chap 5, Sec 5.3 Chap 6, Sec 6.3, 6.4
Essential Knowledge 3.2C2: Properties of definite integrals include the integral of a constant times a function, the integral of the sum of two functions, reversal of limits of integration, and the integral of a function over adjacent intervals.	Chap 5, Sec 5.3 Chap 6, Sec 6.3
Essential Knowledge 3.2C3: The definition of the definite integral may be extended to functions with removable or jump discontinuities.	Chap 5, Sec 5.3
Essential Knowledge 3.2D1: An improper integral is an integral that has one or both limits infinite or has an integrand that is unbounded in the interval of integration.	Chap 7, Sec 7.6
Essential Knowledge 3.2D2: (BC) Improper integrals can be determined using limits of definite integrals.	Chap 7, Sec 7.6
Essential Knowledge 3.3A1: The definite integral can be used to define new functions; for example, $f(x) = \int_0^x e^{-t^2}\,dt$.	Chap 5, Sec 5.4 Chap 6, Sec 6.3, 6.6
Essential Knowledge 3.3A2: If f is a continuous function on the interval $[a, b]$, then $\frac{d}{dx}\left(\int_a^x f(t)\,dt\right) = f(x)$, where x is between a and b.	Chap 6, Sec 6.3, 6.6
Essential Knowledge 3.3A3: Graphical, numerical, analytical, and verbal representations of a function f provide information about the function g defined as $g(x) = \int_a^x f(t)\,dt$.	Chap 5, Sec 5.4 Chap 6, Sec 6.3, 6.4
Essential Knowledge 3.3B1: The function defined by $F(x) = \int_a^x f(t)\,dt$ is an antiderivative of f.	Chap 5, Sec 5.4, 5.5 Chap 6, Sec 6.3
Essential Knowledge 3.3B2: If f is continuous on the interval $[a, b]$ and F is an antiderivative of f, then $\int_a^b f(x)\,dx = F(b) - F(a)$.	Chap 5, Sec 5.4, 5.5 Chap 6, Sec 6.4, 6.5, 6.6
Essential Knowledge 3.3B3: The notation $\int f(x)\,dx = F(x) + C$ means that $F'(x) = f(x)$, and $\int f(x)\,dx$ is called an indefinite integral of the function f.	Chap 5, Sec 5.4, 5.5 Chap 7, Sec 7.1, 7.2, 7.3, 7.4, 7.5, 7.6 Chap 9, Sec 9.10
Essential Knowledge 3.3B4: Many functions do not have closed-form antiderivatives.	Chap 7, Sec 7.5 Chap 8, Sec 8.1, 8.2 Chap 9, Sec 9.10
Essential Knowledge 3.3B5: Techniques for finding antiderivatives include algebraic manipulation such as long division and completing the square, substitution of variables, (BC) integration by parts, and nonrepeating linear partial fractions.	Chap 5, Sec 5.6 Chap 6, Sec 6.6 Chap 7, Sec 7.1, 7.2, 7.3, 7.4, 7.5, 7.6
Essential Knowledge 3.4A1: A function defined as an integral represents an accumulation of a rate of change.	Chap 5, Sec 5.5 Chap 6, Sec 6.3

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 3.4A2: The definite integral of the rate of change of a quantity over an interval gives the net change of that quantity over that interval.	Chap 5, Sec 5.5 Chap 6, Sec 6.3, 6.4
Essential Knowledge 3.4A3: The limit of an approximating Riemann sum can be interpreted as a definite integral.	Chap 5, Sec 5.2, 5.3
Essential Knowledge 3.4B1: The average value of a function f over an interval $[a, b]$ is $\frac{1}{b-a}\int_a^b f(x)\,dx$.	Chap 6, Sec 6.3, 6.4
Essential Knowledge 3.4C1: For a particle in rectilinear motion over an interval of time, the definite integral of velocity represents the particle's displacement over the interval of time, and the definite integral of speed represents the particle's total distance traveled over the interval of time.	Chap 5, Sec 5.5 Chap 6, Sec 6.1, 6.4
Essential Knowledge 3.4C2: (BC) The definite integral can be used to determine displacement, distance, and position of a particle moving along a curve given by parametric or vector-valued functions.	Chap 10, Sec 10.2
Essential Knowledge 3.4D1: Areas of certain regions in the plane can be calculated with definite integrals. (BC) Areas bounded by polar curves can be calculated with definite integrals.	Chap 6, Sec 6.1, 6.5 Chap 10, Sec 10.4
Essential Knowledge 3.4D2: Volumes of solids with known cross sections, including discs and washers, can be calculated with definite integrals.	Chap 6, Sec 6.5
Essential Knowledge 3.4D3: (BC) The length of a planar curve defined by a function or by a parametrically defined curve can be calculated using a definite integral.	Chap 6, Sec 6.6 Chap 10, Sec 10.2
Essential Knowledge 3.4E1: The definite integral can be used to express information about accumulation and net change in many applied contexts.	Chap 5, Sec 5.5 Chap 6, Sec 6.1, 6.3
Essential Knowledge 3.5A1: Antidifferentiation can be used to find specific solutions to differential equations with given initial conditions, including applications to motion along a line, exponential growth and decay, (BC) and logistic growth.	Chap 5, Sec 5.1 Chap 8, Sec 8.2, 8.3
Essential Knowledge 3.5A2: Some differential equations can be solved by separation of variables.	Chap 8, Sec 8.2, 8.3
Essential Knowledge 3.5A3: Solutions to differential equations may be subject to domain restrictions.	Chap 8, Sec 8.2, 8.3
Essential Knowledge 3.5A4: The function F defined by $F(x) = c + \int_a^x f(t)\,dt$ is a general solution to the differential equation $\frac{dy}{dx} = f(x)$, and $F(x) = y_0 + \int_a^x f(t)\,dt$ is a particular solution to the differential equation $\frac{dy}{dx} = f(x)$ satisfying $F(a) = y_0$.	Chap 8, Sec 8.2, 8.3
Essential Knowledge 3.5B1: The model for exponential growth and decay that arises from the statement "The rate of change of a quantity is proportional to the size of the quantity" is $\frac{dy}{dt} = ky$.	Chap 8, Sec 8.3

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 3.5B2: (BC) The model for logistic growth that arises from the statement "The rate of change of a quantity is jointly proportional to the size of the quantity and the difference between the quantity and the carrying capacity" is $\dfrac{dy}{dt} = ky(a - y)$.	Chap 8, Sec 8.3
Big Idea 4: Series (BC)	
Essential Knowledge 4.1A1: The nth partial sum is defined as the sum of the first n terms of a sequence.	Chap 9, Sec 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10
Essential Knowledge 4.1A2: An infinite series of numbers converges to a real number S (or has sum S), if and only if the limit of its sequence of partial sums exists and equals S.	Chap 9, Sec 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10
Essential Knowledge 4.1A3: Common series of numbers include geometric series, the harmonic series, and p-series.	Chap 9, Sec 9.2, 9.3, 9.4, 9.8
Essential Knowledge 4.1A4: A series may be absolutely convergent, conditionally convergent, or divergent.	Chap 9, Sec 9.6, 9.7, 9.8
Essential Knowledge 4.1A5: If a series converges absolutely, then it converges.	Chap 9, Sec 9.8
Essential Knowledge 4.1A6: In addition to examining the limit of the sequence of partial sums of the series, methods for determining whether a series of numbers converges or diverges are the nth term test, the comparison test, the limit comparison test, the integral test, the ratio test, and the alternating series test.	Chap 9, Sec 9.2, 9.3, 9.4, 9.5, 9.6, 9.8
Essential Knowledge 4.1B1: If a is a real number and r is a real number such that $\lvert r \rvert < 1$, then the geometric series $\displaystyle\sum_{n=0}^{\infty} ar^n = \frac{1}{1-r}$.	Chap 9, Sec 9.8, 9.9
Essential Knowledge 4.1B2: If an alternating series converges by the alternating series test, then the alternating series error bound can be used to estimate how close a partial sum is to the value of the infinite series.	Chap 9, Sec 9.5, 9.9
Essential Knowledge 4.1B3: If a series converges absolutely, then any series obtained from it by regrouping or rearranging the terms has the same value.	Chap 9, Sec 9.6, 9.7, 9.8
Essential Knowledge 4.2A1: The coefficient of the nth-degree term in a Taylor polynomial centered at $x = a$ for the function f is $\dfrac{f^{(n)}(a)}{n!}$.	Chap 9, Sec 9.10
Essential Knowledge 4.2A2: Taylor polynomials for a function f centered at $x = a$ can be used to approximate function values of f near $x = a$.	Chap 9, Sec 9.10
Essential Knowledge 4.2A3: In many cases, as the degree of a Taylor polynomial increases, the nth-degree polynomial will converge to the original function over some interval.	Chap 9, Sec 9.9, 9.10
Essential Knowledge 4.2A4: The Lagrange error bound can be used to bound the error of a Taylor polynomial approximation to a function.	Chap 9, Sec 9.10

AP® Calculus Concept	Correlation of Essential Knowledge Statements to *Calculus for AP®*
Essential Knowledge 4.2A5: In some situations where the signs of a Taylor polynomial are alternating, the alternating series error bound can be used to bound the error of a Taylor polynomial approximation to the function.	Chap 9, Sec 9.10
Essential Knowledge 4.2B1: A power series is a series of the form $\sum_{n=0}^{\infty} a_n(x-r)^n$, where n is a nonnegative integer, $\{a_n\}$ is a sequence of real numbers, and r is a real number.	Chap 9, Sec 9.8, 9.9
Essential Knowledge 4.2B2: The Maclaurin series for $\sin(x)$, $\cos(x)$, and e^x provide the foundation for constructing the Maclaurin series for other functions.	Chap 9, Sec 9.10
Essential Knowledge 4.2B3: The Maclaurin series for $\frac{1}{1-x}$ is a geometric series.	Chap 9, Sec 9.10
Essential Knowledge 4.2B4: A Taylor polynomial for $f(x)$ is a partial sum of the Taylor series for $f(x)$.	Chap 9, Sec 9.10
Essential Knowledge 4.2B5: A power series for a given function can be derived by various methods (e.g., algebraic processes, substitutions, using properties of geometric series, and operations on known series such as term-by-term integration or term-by-term differentiation).	Chap 9, Sec 9.9, 9.10
Essential Knowledge 4.2C1: If a power series converges, it either converges at a single point or has an interval of convergence.	Chap 9, Sec 9.8, 9.9, 9.10
Essential Knowledge 4.2C2: The ratio test can be used to determine the radius of convergence of a power series.	Chap 9, Sec 9.8, 9.9, 9.10
Essential Knowledge 4.2C3: If a power series has a positive radius of convergence, then the power series is the Taylor series of the function to which it converges over the open interval.	Chap 9, Sec 9.10
Essential Knowledge 4.2C4: The radius of convergence of a power series obtained by term-by-term differentiation or term-by-term integration is the same as the radius of convergence of the original power series.	Chap 9, Sec 9.9, 9.10