

Correlation from *Calculus for AP*[®] to College Board AP[®] Calculus AB and AP[®] Calculus BC Framework

Lesson	Topic(s)	Learning Objective(s)
Chapter P: Preparation for Calculus		
P.1	Graphs and Models	Prerequisite topics
P.2	Linear Models and Rates of Change	Prerequisite topics
P.3	Functions and Their Graphs	Prerequisite topics
P.4	Inverse Functions	Prerequisite topics
P.5	Exponential and Logarithmic Functions	Prerequisite topics
Chapter 1: Limits and Their Properties		
1.1	A Preview of Calculus	CHA-1.A
1.2	Finding Limits Graphically and Numerically	LIM-1.A, LIM-1.B, LIM-1.C
1.3	Evaluating Limits Analytically	LIM-1.B, LIM-1.D, LIM-1.E
1.4	Continuity and One-Sided Limits	LIM-1.C, LIM-1.D, LIM-2.A, LIM-2.B, LIM-2.C, FUN-1.A
1.5	Infinite Limits	LIM-2.A, LIM-2.D
1.6	Limits at Infinity	LIM-2.D
Chapter 2: Differentiation		
2.1	The Derivative and the Tangent Line Problem	CHA-2.A, CHA-2.B, CHA-2.C, CHA-2.D, CHA-3.A, FUN-2.A, FUN-3.A
2.2	Basic Differentiation Rules and Rates of Change	CHA-2.A, CHA-2.B, CHA-3.A, CHA-3.B, FUN-3.A
2.3	Product and Quotient Rules and Higher-Order Derivatives	FUN-3.B, FUN-3.F, CHA-3.B
2.4	The Chain Rule	FUN-3.A, FUN-3.C
2.5	Implicit Differentiation	FUN-3.D, FUN-4.E
2.6	Derivatives of Inverse Functions	FUN-3.E
2.7	Related Rates	CHA-3.B, CHA-3.C, CHA-3.D, CHA-3.E
2.8	Newton's Method	
Chapter 3: Applications of Differentiation		
3.1	Extrema on an Interval	FUN-1.C, FUN-4.A, FUN-4.D
3.2	Rolle's Theorem and the Mean Value Theorem	FUN-1.B
3.3	Increasing and Decreasing Functions and the First Derivative Test	FUN-4.A
3.4	Concavity and the Second Derivative Test	FUN-4.A
3.5	A Summary of Curve Sketching	FUN-4.A
3.6	Optimization Problems	FUN-4.B, FUN-4.C
3.7	Differentials	CHA-3.F

Lesson	Topic(s)	Learning Objective(s)	
Chapter 4: Integration			
4.1	Antiderivatives and Indefinite Integration	6.7, 6.8, 6.14, 7.1, 7.6, 7.7	FUN-6.B, FUN-6.C, FUN-7.A, FUN-7.D, FUN-7.E
4.2	Area	6.1	CHA-4.A
4.3	Riemann Sums and Definite Integrals	6.2, 6.3, 6.6, 6.8	LIM-5.A, LIM-5.B, LIM-5.C, FUN-6.A, FUN-6.C
4.4	The Fundamental Theorem of Calculus	6.1, 6.4, 6.5, 6.6, 6.7, 8.1, 8.3	CHA-4.A, CHA-4.B, CHA-4.D, FUN-5.A, FUN-6.A, FUN-6.B
4.5	The Net Change Theorem	6.1, 8.2, 8.3	CHA-4.A, CHA-4.C, CHA-4.D, CHA-4.E
4.6	Integration by Substitution	6.9	FUN-6.D
4.7	The Natural Logarithmic Function: Integration	6.10	FUN-6.D
4.8	Inverse Trigonometric Functions: Integration	6.10, 6.14	FUN-6.D
Chapter 5: Differential Equations			
5.1	Slope Fields and Euler's Method	7.1, 7.2, 7.3, 7.4, 7.5, 7.7	FUN-7.A, FUN-7.B, FUN-7.C, FUN-7.E
5.2	Growth and Decay	7.6, 7.7, 7.8	FUN-7.D, FUN-7.E, FUN-7.F, FUN-7.G
5.3	Separation of Variables	7.6, 7.7	FUN-7.D, FUN-7.E
5.4	The Logistic Equation	7.9	FUN-7.H
Chapter 6: Applications of Integration			
6.1	Area of a Region Between Two Curves	8.4, 8.5, 8.6	CHA-5.A
6.2	Volume: The Disk and Washer Methods	8.7, 8.8, 8.9, 8.10, 8.11, 8.12	CHA-5.B, CHA-5.C
6.3	Volume: The Shell Method		
6.4	Arc Length and Surfaces of Revolution	8.13	CHA-6.A
Chapter 7: Integration Techniques, L'Hôpital's Rule, and Improper Integrals			
7.1	Basic Integration Rules	6.9, 6.10, 6.14	FUN-6.D
7.2	Integration by Parts	6.11, 6.14	FUN-6.E
7.3	Trigonometric Integrals	6.14	
7.4	Trigonometric Substitution	6.14	
7.5	Partial Fractions	6.12, 6.14	FUN-6.F
7.6	Integration by Tables and Other Integration Techniques	6.14	
7.7	Indeterminate Forms and L'Hôpital's Rule	4.7	LIM-4.A
7.8	Improper Integrals	6.13	LIM-6.A

Lesson	Topic(s)	Learning Objective(s)
Chapter 8: Infinite Series		
8.1	Sequences	
8.2	Series and Convergence	10.1, 10.2, 10.3
8.3	The Integral Test and p -Series	10.4, 10.5
8.4	Comparisons of Series	10.6
8.5	Alternating Series	10.7, 10.9, 10.10
8.6	The Ratio and Root Tests	10.8
8.7	Taylor Polynomials and Approximations	10.11, 10.12
8.8	Power Series	10.13
8.9	Representation of Functions by Power Series	10.12, 10.14, 10.15
8.10	Taylor and Maclaurin Series	10.13, 10.14
Chapter 9: Parametric Equations, Polar Coordinates, and Vectors		
9.1	Conics and Calculus	
9.2	Plane Curves and Parametric Equations	
9.3	Parametric Equations and Calculus	9.1, 9.2, 9.3
9.4	Polar Coordinates and Polar Graphs	9.7
9.5	Area and Arc Length in Polar Coordinates	9.8, 9.9
9.6	Vectors in the Plane	
9.7	Vector-Valued Functions	9.4, 9.5
9.8	Velocity and Acceleration	9.6

Correlation from College Board AP[®] Calculus AB and AP[®] Calculus BC Framework to *Calculus for AP[®]*

Course: AP[®] Calculus AB and BC

Unit 1: Limits and Continuity

Suggested Length: AB ~22-23 class periods

BC ~13-14 class periods

AP Exam Weighting: AB 10-12%

BC 4-7%

Big Ideas: Change (CHA); Limits (LIM); Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
1.1: Introducing Calculus: Can Change Occur at an Instant?	CHA-1: Calculus allows us to generalize knowledge about motion to diverse problems involving change. CHA-1.A: Interpret the rate of change at an instant in terms of average rates of change over intervals containing that instant.	CHA-1.A.1	1.1, pp. 58-59
		CHA-1.A.2	1.1, pp. 58-59
		CHA-1.A.3	1.1, pp. 58-59
1.2: Defining Limits and Using Limit Notation	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.A: Represent limits analytically using correct notation.	LIM-1.A.1	1.2, p. 65
	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.B: Interpret limits expressed in analytic notation.	LIM-1.B.1	1.2, pp. 65-71 1.3, pp. 76-83
1.3: Estimating Limit Values from Graphs	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.C: Estimate limits of functions.	LIM-1.C.1	1.4, pp. 89-91
		LIM-1.C.2	1.2, p. 66
		LIM-1.C.3	1.2, p. 68
		LIM-1.C.4	1.2, pp. 67-68
1.4: Estimating Limit Values from Tables	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.C: Estimate limits of functions.	LIM-1.C.5	1.2, p. 66
1.5: Determining Limits Using Algebraic Properties of Limits	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.D: Determine the limits of functions using limit theorems.	LIM-1.D.1	1.4, pp. 89-91
		LIM-1.D.2	1.3, pp. 76-78
1.6: Determining Limits Using Algebraic Manipulation	LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits. LIM-1.E: Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.	LIM-1.E.1	1.3, pp. 79-83

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
1.7: Selecting Procedures for Determining Limits			1.3, p. 79
1.8: Determining Limits Using the Squeeze Theorem	<p>LIM-1: Reasoning with definitions, theorems, and properties can be used to justify claims about limits.</p> <p>LIM-1.E: Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.</p>	LIM-1.E.2	1.3, pp. 82-83
1.9: Connecting Multiple Representations of Limits			1.2, p. 66, Example 1 1.3, p. 83, Example 9 1.5, p. 101, Example 1 1.6, p. 110, Example 2
1.10: Exploring Types of Discontinuities	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.A: Justify conclusions about continuity at a point using the definition.</p>	LIM-2.A.1	1.4, p. 88 1.5, pp. 102-104
1.11: Defining Continuity at a Point	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.A: Justify conclusions about continuity at a point using the definition.</p>	LIM-2.A.2	1.4, pp. 87-88
1.12: Confirming Continuity over an Interval	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.B: Determine intervals over which a function is continuous.</p>	LIM-2.B.1	1.4, pp. 87-95
		LIM-2.B.2	1.4, p. 92
1.13: Removing Discontinuities	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.C: Determine values of x or solve for parameters that make discontinuous functions continuous, if possible.</p>	LIM-2.C.1	1.4, p. 88
		LIM-2.C.2	1.4, p. 88
1.14: Connecting Infinite Limits and Vertical Asymptotes	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.D: Interpret the behavior of functions using limits involving infinity.</p>	LIM-2.D.1	1.5, pp. 100-104
		LIM-2.D.2	1.5, pp. 100-104
1.15: Connecting Limits at Infinity and Horizontal Asymptotes	<p>LIM-2: Reasoning with definitions, theorems, and properties can be used to justify claims about continuity.</p> <p>LIM-2.D: Interpret the behavior of functions using limits involving infinity.</p>	LIM-2.D.3	1.6, pp. 108-114
		LIM-2.D.4	1.6, pp. 108-114
		LIM-2.D.5	1.6, pp. 108-114
1.16: Working with the Intermediate Value Theorem (IVT)	<p>FUN-1: Existence theorems allow us to draw conclusions about a function's behavior on an interval without precisely locating that behavior.</p> <p>FUN-1.A: Explain the behavior of a function on an interval using the Intermediate Value Theorem.</p>	FUN-1.A.1	1.4, pp. 94-95

Course: AP[®] Calculus AB and BC

Unit 2: Differentiation: Definition and Fundamental Properties

Suggested Length: AB ~13-14 class periods
BC ~9-10 class periods

AP Exam Weighting: AB 10-12%
BC 4-7%

Big Ideas: Change (CHA); Limits (LIM); Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
2.1: Defining Average and Instantaneous Rates of Change at a Point	CHA-2: Derivatives allow us to determine rates of change at an instant by applying limits to knowledge about rates of change over intervals. CHA-2.A: Determine average rates of change using difference quotients.	CHA-2.A.1	2.1, p. 125 2.2, pp. 142-143
	CHA-2: Derivatives allow us to determine rates of change at an instant by applying limits to knowledge about rates of change over intervals. CHA-2.B: Represent the derivative of a function as the limit of a difference quotient.	CHA-2.B.1	2.1, p. 127 2.2, pp. 142-143
2.2: Defining the Derivative of a Function and Using Derivative Notation	CHA-2: Derivatives allow us to determine rates of change at an instant by applying limits to knowledge about rates of change over intervals. CHA-2.B: Represent the derivative of a function as the limit of a difference quotient.	CHA-2.B.2	2.1, p. 127
		CHA-2.B.3	2.1, p. 127
	CHA-2.B.4: Represent the derivative of a function as the limit of a difference quotient.	CHA-2.B.4	2.1, pp. 127-128
2.3: Estimating Derivatives of a Function at a Point	CHA-2: Derivatives allow us to determine rates of change at an instant by applying limits to knowledge about rates of change over intervals. CHA-2.C: Determine the equation of a line tangent to a curve at a given point.	CHA-2.C.1	2.1, pp. 124-128
		CHA-2.D: Estimate derivatives.	CHA-2.D.1
2.4: Connecting Differentiability and Continuity: Determining When Derivatives Do and Do Not Exist	FUN-2: Recognizing that a function's derivative may also be a function allows us to develop knowledge about the related behaviors of both. FUN-2.A: Explain the relationship between differentiability and continuity.	CHA-2.D.2	2.1, p. 130
		FUN-2.A.1	2.1, pp. 129-130
2.5: Applying the Power Rule	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.A: Calculate derivatives of familiar functions.	FUN-2.A.2	2.1, pp. 129-130
		FUN-3.A.1	2.2, pp. 136-137
2.6: Derivative Rules: Constant, Sum, Difference, and Constant Multiple	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.A: Calculate derivatives of familiar functions.	FUN-3.A.2	2.2, pp. 135, 138-139
		FUN-3.A.3	2.2, p. 139

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
2.7: Derivatives of $\cos x$, $\sin x$, e^x , and $\ln x$	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.A: Calculate derivatives of familiar functions.	FUN-3.A.4	2.2, pp. 140-141 2.4, pp. 165-168
	LIM-3: Reasoning with definitions, theorems, and properties can be used to determine a limit. LIM-3.A: Interpret a limit as a definition of a derivative.	LIM-3.A.1	2.1, p. 127
2.8: The Product Rule	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.B: Calculate derivatives of products and quotients of differentiable functions.	FUN-3.B.1	2.3, pp. 148-149
2.9: The Quotient Rule	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.B: Calculate derivatives of products and quotients of differentiable functions.	FUN-3.B.2	2.3, pp. 150-152
2.10: Finding the Derivatives of Tangent, Cotangent, Secant, and/or Cosecant Functions	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.B: Calculate derivatives of products and quotients of differentiable functions.	FUN-3.B.3	2.3, pp. 152-153

Course: AP[®] Calculus AB and BC

Unit 3: Differentiation: Composite, Implicit, and Inverse Functions

Suggested Length: AB ~10-11 class periods

AP Exam Weighting: AB 9-13%

BC ~8-9 class periods

BC 4-7%

Big Ideas: Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
3.1: The Chain Rule	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.C: Calculate derivatives of compositions of differentiable functions.	FUN-3.C.1	2.4, pp. 159-168
3.2: Implicit Differentiation	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.D: Calculate derivatives of implicitly defined functions.	FUN-3.D.1	2.5, pp. 174-179
3.3: Differentiating Inverse Functions	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.E: Calculate derivatives of inverse and inverse trigonometric functions.	FUN-3.E.1	2.6, pp. 183-186

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
3.4: Differentiating Inverse Trigonometric Functions	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.E: Calculate derivatives of inverse and inverse trigonometric functions.	FUN-3.E.2	2.6, pp. 184-186
3.5: Selecting Procedures for Calculating Derivatives			2.4, p. 168 2.6, p. 186
3.6: Calculating Higher-Order Derivatives	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.F: Determine higher-order derivatives of a function.	FUN-3.F.1	2.3, p. 153
		FUN-3.F.2	2.3, p. 153

Course: AP[®] Calculus AB and BC

Unit 4: Contextual Applications of Differentiation

Suggested Length: AB ~10-11 class periods
BC ~6-7 class periods

AP Exam Weighting: AB 10-15%
BC 6-9%

Big Ideas: Change (CHA); Limits (LIM)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
4.1: Interpreting the Meaning of the Derivative in Context	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.A: Interpret the meaning of a derivative in context.	CHA-3.A.1	2.1, p. 127
		CHA-3.A.2	2.2, pp. 142-143
		CHA-3.A.3	2.2, pp. 142-143
4.2: Straight-Line Motion: Connecting Position, Velocity, and Acceleration	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.B: Calculate rates of change in applied contexts.	CHA-3.B.1	2.2, pp. 142-143 2.3, p. 154 2.7, pp. 193-194
4.3: Rates of Change in Applied Contexts Other Than Motion	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.C: Interpret rates of change in applied contexts.	CHA-3.C.1	2.7, pp. 191-192
4.4: Introduction to Related Rates	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.D: Calculate related rates in applied contexts.	CHA-3.D.1	2.7, pp. 190-194
		CHA-3.D.2	2.7, pp. 190-194
4.5: Solving Related Rates Problems	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.E: Interpret related rates in applied contexts.	CHA-3.E.1	2.7, pp. 190-194

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
4.6: Approximating Values of a Function Using Local Linearity and Linearization	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.F: Approximate a value on a curve using the equation of a tangent line.	CHA-3.F.1	3.7, pp. 267-271
		CHA-3.F.2	3.7, pp. 267-271
4.7: Using L'Hospital's Rule for Determining Limits of Indeterminate Forms	LIM-4: L'Hospital's rule allows us to determine the limits of some indeterminate forms. LIM-4.A: Determine limits of functions that result in indeterminate forms.	LIM-4.A.1	7.7, p. 506
		LIM-4.A.2	7.7, pp. 507-509

Course: AP[®] Calculus AB and BC

Unit 5: Analytical Applications of Differentiation

Suggested Length: AB ~15-16 class periods
BC ~10-11 class periods

AP Exam Weighting: AB 15-18%
BC 8-11%

Big Ideas: Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
5.1: Using the Mean Value Theorem	FUN-1: Existence theorems allow us to draw conclusions about a function's behavior on an interval without precisely locating that behavior. FUN-1.B: Justify conclusions about functions by applying the Mean Value Theorem over an interval.	FUN-1.B.1	3.2, pp. 222-223
5.2: Extreme Value Theorem, Global Versus Local Extrema, and Critical Points	FUN-1: Existence theorems allow us to draw conclusions about a function's behavior on an interval without precisely locating that behavior. FUN-1.C: Justify conclusions about functions by applying the Extreme Value Theorem.	FUN-1.C.1	3.1, p. 212
5.3: Determining Intervals on Which a Function Is Increasing or Decreasing	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.1	3.3, pp. 227-232
5.4: Using the First Derivative Test to Determine Relative (Local) Extrema	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.2	3.1, pp. 212-216
5.5: Using the Candidates Test to Determine Absolute (Global) Extrema	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.3	3.1, pp. 212-216

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
5.6: Determining Concavity of Functions over Their Domains	FUN-4: A function's derivative can be used to understand some behaviors of the function.	FUN-4.A.4	3.4, p. 237
	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.5	3.4, pp. 238-241
		FUN-4.A.6	3.4, pp. 239-240
5.7: Using the Second Derivative Test to Find Extrema	FUN-4: A function's derivative can be used to understand some behaviors of the function.	FUN-4.A.7	3.4, p. 241
	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.8	3.4, p. 241
5.8: Sketching Graphs of Functions and Their Derivatives	FUN-4: A function's derivative can be used to understand some behaviors of the function.	FUN-4.A.9	3.5, pp. 245-252
	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.10	3.5, pp. 245-252
5.9: Connecting a Function, Its First Derivative, and Its Second Derivative	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	FUN-4.A.11	3.5, pp. 245-252
5.10: Introduction to Optimization Problems	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.B: Calculate minimum and maximum values in applied contexts or analysis of functions.	FUN-4.B.1	3.6, pp. 257-261
5.11: Solving Optimization Problems	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.C: Interpret minimum and maximum values calculated in applied contexts.	FUN-4.C.1	3.6, pp. 257-261
5.12: Exploring Behaviors of Implicit Relations	FUN-4: A function's derivative can be used to understand some behaviors of the function. FUN-4.D: Determine critical points of implicit relations.	FUN-4.D.1	3.1, pp. 213-216
	FUN-4: A function's derivative can be used to understand some behaviors of the function.	FUN-4.E.1	2.5, pp. 174-179
	FUN-4.E: Justify conclusions about the behavior of an implicitly defined function based on evidence from its derivatives.	FUN-4.E.2	2.5, p. 178

Course: AP[®] Calculus AB and BC

Unit 6: Integration and Accumulation of Change

Suggested Length: AB ~18-20 class periods
BC ~15-16 class periods

AP Exam Weighting: AB 17-20%
BC 17-20%

Big Ideas: Change (CHA); Limits (LIM); Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
6.1: Exploring Accumulations of Change	<p>CHA-4: Definite integrals allow us to solve problems involving the accumulation of change over an interval.</p> <p>CHA-4.A: Interpret the meaning of areas associated with the graph of a rate of change in context.</p>	CHA-4.A.1	4.4, p. 323 4.5, p. 330
		CHA-4.A.2	4.2, pp. 292-293
		CHA-4.A.3	4.5, p. 331
		CHA-4.A.4	4.5, p. 330
6.2: Approximating Areas with Riemann Sums	<p>LIM-5: Definite integrals can be approximated using geometric and numerical methods.</p> <p>LIM-5.A: Approximate a definite integral using geometric and numerical methods.</p>	LIM-5.A.1	4.3, pp. 304-311
		LIM-5.A.2	4.3, pp. 302-305, 309-311
		LIM-5.A.3	4.3, pp. 309-310
		LIM-5.A.4	4.3, pp. 309-310
6.3: Riemann Sums, Summation Notation, and Definite Integral Notation	<p>LIM-5: Definite integrals can be approximated using geometric and numerical methods.</p> <p>LIM-5.B: Interpret the limiting case of the Riemann sum as a definite integral.</p>	LIM-5.B.1	4.3, pp. 304-305
		LIM-5.B.2	4.3, pp. 302-303
	<p>LIM-5: Definite integrals can be approximated using geometric and numerical methods.</p> <p>LIM-5.C: Represent the limiting case of the Riemann sum as a definite integral.</p>	LIM-5.C.1	4.3, p. 304
		LIM-5.C.2	4.3, p. 304
6.4: The Fundamental Theorem of Calculus and Accumulation Functions	<p>FUN-5: The Fundamental Theorem of Calculus connects differentiation and integration.</p> <p>FUN-5.A: Represent accumulation functions using definite integrals.</p>	FUN-5.A.1	4.4, pp. 323-325
		FUN-5.A.2	4.4, pp. 324-325
6.5: Interpreting the Behavior of Accumulation Functions Involving Area	<p>FUN-5: The Fundamental Theorem of Calculus connects differentiation and integration.</p> <p>FUN-5.A: Represent accumulation functions using definite integrals.</p>	FUN-5.A.3	4.4, pp. 323-325
6.6: Applying Properties of Definite Integrals	<p>FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration.</p> <p>FUN-6.A: Calculate a definite integral using areas and properties of definite integrals.</p>	FUN-6.A.1	4.4, pp. 320-321
		FUN-6.A.2	4.3, pp. 307-308
		FUN-6.A.3	4.3, p. 308

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
6.7: The Fundamental Theorem of Calculus and Definite Integrals	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.B: Evaluate definite integrals analytically using the Fundamental Theorem of Calculus.	FUN-6.B.1	4.1, pp. 280-281
		FUN-6.B.2	4.4, pp. 324-325
		FUN-6.B.3	4.4, pp. 317-319
6.8: Finding Antiderivatives and Indefinite Integrals: Basic Rules and Notation	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.C: Determine antiderivatives of functions and indefinite integrals, using knowledge of derivatives.	FUN-6.C.1	4.1, pp. 280-281
		FUN-6.C.2	4.1, pp. 282-284
		FUN-6.C.3	4.3, p. 309
6.9: Integrating Using Substitution	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.D: For integrands requiring substitution or rearrangements into equivalent forms: (a) Determine indefinite integrals. (b) Evaluate definite integrals.	FUN-6.D.1	4.6, pp. 337-342 7.1, pp. 456-459
		FUN-6.D.2	4.6, pp. 340-342
6.10: Integrating Functions Using Long Division and Completing the Square	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.D: For integrands requiring substitution or rearrangements into equivalent forms: (a) Determine indefinite integrals. (b) Evaluate definite integrals.	FUN-6.D.3	4.7, p. 349 4.8, p. 358 7.1, pp. 456, 459
6.11: Integrating Using Integration by Parts BC ONLY	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.E: For integrands requiring integration by parts: (a) Determine indefinite integrals. BC ONLY (b) Evaluate definite integrals. BC ONLY	FUN-6.E.1	7.2, pp. 463-468
6.12: Integrating Using Linear Partial Fractions BC ONLY	FUN-6: Recognizing opportunities to apply knowledge of geometry and mathematical rules can simplify integration. FUN-6.F: For integrands requiring integration by linear partial fractions: (a) Determine indefinite integrals. BC ONLY (b) Evaluate definite integrals. BC ONLY	FUN-6.F.1	7.5, pp. 491-497
6.13: Evaluating Improper Integrals BC ONLY	LIM-6: The use of limits allows us to show that the areas of unbounded regions may be finite. LIM-6.A: Evaluate an improper integral or determine that the integral diverges. BC ONLY	LIM-6.A.1	7.8, p. 517
		LIM-6.A.2	7.8, pp. 517-523
6.14: Selecting Techniques for Antidifferentiation			4.1, p. 282 4.8, p. 359 7.1, p. 459 7.2-7.6, pp. 463-505

Highlighting indicates topics and sections that are BC only.

Course: AP[®] Calculus AB and BC

Unit 7: Differential Equations

Suggested Length: AB ~8-9 class periods
BC ~9-10 class periods

AP Exam Weighting: AB 6-12%
BC 6-9%

Big Ideas: Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
7.1: Modeling Situations with Differential Equations	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.A: Interpret verbal statements of problems as differential equations involving a derivative expression.	FUN-7.A.1	4.1, p. 281 5.1, p. 370
7.2: Verifying Solutions for Differential Equations	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.B: Verify solutions to differential equations.	FUN-7.B.1	5.1, pp. 370-371
		FUN-7.B.2	5.1, pp. 370-371
7.3: Sketching Slope Fields	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.C: Estimate solutions to differential equations.	FUN-7.C.1	5.1, pp. 372-373
		FUN-7.C.2	5.1, pp. 372-373
7.4: Reasoning Using Slope Fields	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.C: Estimate solutions to differential equations.	FUN-7.C.3	5.1, pp. 370-371
7.5: Approximating Solutions Using Euler's Method BC ONLY	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.C: Estimate solutions to differential equations.	FUN-7.C.4	5.1, p. 374
7.6: Finding General Solutions Using Separation of Variables	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.D: Determine general solutions to differential equations.	FUN-7.D.1	5.2, pp. 379-380, 383 5.3, pp. 387-392
		FUN-7.D.2	4.1, p. 281 5.2, pp. 379-380, 383 5.3, p. 387
7.7: Finding Particular Solutions Using Initial Conditions and Separation of Variables	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.E: Determine particular solutions to differential equations.	FUN-7.E.1	4.1, p. 285 5.1, pp. 370-371 5.2, pp. 379-380, 383 5.3, pp. 387-388
		FUN-7.E.2	4.1, pp. 285-286 5.3, p. 388
		FUN-7.E.3	5.3, p. 388, Example 3

Highlighting indicates topics and sections that are BC only.

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
7.8: Exponential Models with Differential Equations	FUN-7: Solving differential equations allows us to determine functions and develop models.	FUN-7.F.1	5.2, pp. 380-383
	FUN-7.F: Interpret the meaning of a differential equation and its variables in context.	FUN-7.F.2	5.2, p. 380
	FUN-7: Solving differential equations allows us to determine functions and develop models. FUN-7.G: Determine general and particular solutions for problems involving differential equations in context.	FUN-7.G.1	5.2, pp. 380-383
7.9: Logistic Models with Differential Equations BC ONLY	FUN-7: Solving differential equations allows us to determine functions and develop models.	FUN-7.H.1	5.4, pp. 397-401
	FUN-7.H: Interpret the meaning of the logistic growth model in context. BC ONLY	FUN-7.H.2	5.4, pp. 398, 400
		FUN-7.H.3	5.4, p. 401
		FUN-7.H.4	5.4, p. 403, Exercise 31

Course: AP[®] Calculus AB and BC

Unit 8: Applications of Integration

Suggested Length: AB ~19-20 class periods
BC ~13-14 class periods

AP Exam Weighting: AB 10-15%
BC 6-9%

Big Ideas: Change (CHA)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
8.1: Finding the Average Value of a Function on an Interval	CHA-4: Definite integrals allow us to solve problems involving the accumulation of change over an interval. CHA-4.B: Determine the average value of a function using definite integrals.	CHA-4.B.1	4.4, pp. 321-322
8.2: Connecting Position, Velocity, and Acceleration of Functions Using Integrals	CHA-4: Definite integrals allow us to solve problems involving the accumulation of change over an interval. CHA-4.C: Determine values for positions and rates of change using definite integrals in problems involving rectilinear motion.	CHA-4.C.1	4.5, pp. 329-330
8.3: Using Accumulation Functions and Definite Integrals in Applied Contexts	CHA-4: Definite integrals allow us to solve problems involving the accumulation of change over an interval.	CHA-4.D.1	4.4, pp. 323-324
	CHA-4.D: Interpret the meaning of a definite integral in accumulation problems.	CHA-4.D.2	4.5, pp. 329-330
	CHA-4: Definite integrals allow us to solve problems involving the accumulation of change over an interval. CHA-4.E: Determine net change using definite integrals in applied contexts.	CHA-4.E.1	4.5, pp. 329-331

Highlighting indicates topics and sections that are BC only.

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
8.4: Finding the Area Between Curves Expressed as Functions of x	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.A: Calculate areas in the plane using the definite integral.	CHA-5.A.1	6.1, pp. 410-415
8.5: Finding the Area Between Curves Expressed as Functions of y	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.A: Calculate areas in the plane using the definite integral.	CHA-5.A.2	6.1, p. 414
8.6: Finding the Area Between Curves That Intersect at More Than Two Points	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.A: Calculate areas in the plane using the definite integral.	CHA-5.A.3	6.1, pp. 413-414
8.7: Volumes with Cross Sections: Squares and Rectangles	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.B: Calculate volumes of solids with known cross sections using definite integrals.	CHA-5.B.1	6.2, pp. 425-426
8.8: Volumes with Cross Sections: Triangles and Semicircles	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.B: Calculate volumes of solids with known cross sections using definite integrals.	CHA-5.B.2	6.2, pp. 425-426
		CHA-5.B.3	6.2, pp. 425-426
8.9: Volume with Disc Method: Revolving Around the x - or y -Axis	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	CHA-5.C.1	6.2, pp. 420-422
8.10: Volume with Disc Method: Revolving Around Other Axes	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	CHA-5.C.2	6.2, pp. 420-422
8.11: Volume with Washer Method: Revolving Around the x - or y -Axis	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	CHA-5.C.3	6.2, pp. 423-425
8.12: Volume with Washer Method: Revolving Around Other Axes	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	CHA-5.C.4	6.2, pp. 423-425
8.13: The Arc Length of a Smooth, Planar Curve and Distance Traveled BC ONLY	CHA-6: Definite integrals allow us to solve problems involving the accumulation of change in length over an interval. CHA-6.A: Determine the length of a curve in the plane defined by a function, using a definite integral. BC ONLY	CHA-6.A.1	6.4, pp. 440-443

Highlighting indicates topics and sections that are BC only.

Course: AP[®] Calculus BC Only

Unit 9: Parametric Equations, Polar Coordinates, and Vector-Valued Functions

Suggested Length: AB Not Applicable
BC ~10-11 class periods

AP Exam Weighting: AB Not Applicable
BC 11-12%

Big Ideas: Change (CHA); Analysis of Functions (FUN)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
9.1: Defining and Differentiating Parametric Equations BC ONLY	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.G: Calculate derivatives of parametric functions. BC ONLY	CHA-3.G.1	9.3, pp. 655-658
		CHA-3.G.2	9.3, pp. 655-658
9.2: Second Derivatives of Parametric Equations BC ONLY	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.G: Calculate derivatives of parametric functions. BC ONLY	CHA-3.G.3	9.3, p. 656
9.3: Finding Arc Lengths of Curves Given by Parametric Equations BC ONLY	CHA-6: Definite integrals allow us to solve problems involving the accumulation of change in length over an interval. CHA-6.B: Determine the length of a curve in the plane defined by parametric functions, using a definite integral. BC ONLY	CHA-6.B.1	9.3, pp. 657-658
9.4: Defining and Differentiating Vector-Valued Functions BC ONLY	CHA-3: Derivatives allow us to solve real-world problems involving rates of change. CHA-3.H: Calculate derivatives of vector-valued functions. BC ONLY	CHA-3.H.1	9.7, pp. 689-693
9.5: Integrating Vector-Valued Functions BC ONLY	FUN-8: Solving an initial value problem allows us to determine an expression for the position of a particle moving in the plane. FUN-8.A: Determine a particular solution given a rate vector and initial conditions. BC ONLY	FUN-8.A.1	9.7, p. 694
9.6: Solving Motion Problems Using Parametric and Vector-Valued Functions BC ONLY	FUN-8: Solving an initial value problem allows us to determine an expression for the position of a particle moving in the plane. FUN-8.B: Determine values for positions and rates of change in problems involving planar motion. BC ONLY	FUN-8.B.1	9.8, pp. 698-700
		FUN-8.B.2	9.8, p. 701
9.7: Defining Polar Coordinates and Differentiating in Polar Form BC ONLY	FUN-3: Recognizing opportunities to apply derivative rules can simplify differentiation. FUN-3.G: Calculate derivatives of functions written in polar coordinates. BC ONLY	FUN-3.G.1	9.4, pp. 663-669
		FUN-3.G.2	9.4, pp. 667-668

Highlighting indicates topics and sections that are BC only.

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
9.8: Finding the Area of a Polar Region or the Area Bounded by a Single Polar Curve BC ONLY	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.D: Calculate areas of regions defined by polar curves using definite integrals. BC ONLY	CHA-5.D.1	9.5, pp. 673-674
9.9: Finding the Area of the Region Bounded by Two Polar Curves BC ONLY	CHA-5: Definite integrals allow us to solve problems involving the accumulation of change in area or volume over an interval. CHA-5.D: Calculate areas of regions defined by polar curves using definite integrals. BC ONLY	CHA-5.D.2	9.5, p. 676

Course: AP[®] Calculus BC Only

Unit 10: Infinite Sequences and Series

Suggested Length: AB Not Applicable
BC ~17-18 class periods

AP Exam Weighting: AB Not Applicable
BC 17-18%

Big Ideas: Limits (LIM)

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
10.1: Defining Convergent and Divergent Infinite Series BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.1	8.2, pp. 545-547
		LIM-7.A.2	8.2, pp. 545-547
10.2: Working with Geometric Series BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.3	8.2, pp. 547-548
		LIM-7.A.4	8.2, pp. 547-548
10.3: The nth-Term Test for Divergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.5	8.2, pp. 549-550
10.4: Integral Test for Convergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.6	8.3, pp. 555-556
10.5: Harmonic Series and p-Series BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.7	8.3, pp. 557-558
10.6: Comparison Tests for Convergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.8	8.4, pp. 562-563
		LIM-7.A.9	8.4, pp. 564-565

Highlighting indicates topics and sections that are BC only.

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
10.7: Alternating Series Test for Convergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.10	8.5, pp. 569-574
10.8: Ratio Test for Convergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.11	8.6, pp. 577-579
10.9: Determining Absolute or Conditional Convergence BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.A: Determine whether a series converges or diverges. BC ONLY	LIM-7.A.12	8.5, pp. 572-573
		LIM-7.A.13	8.5, pp. 572-573
		LIM-7.A.14	8.5, p. 574
10.10: Alternating Series Error Bound BC ONLY	LIM-7: Applying limits may allow us to determine the finite sum of infinitely many terms. LIM-7.B: Approximate the sum of a series. BC ONLY	LIM-7.B.1	8.5, p. 571
10.11: Finding Taylor Polynomial Approximations of Functions BC ONLY	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.A: Represent a function at a point as a Taylor polynomial. BC ONLY	LIM-8.A.1	8.7, pp. 588-593
		LIM-8.A.2	8.7, pp. 588-590
		LIM-8.B.1	8.7, p. 591
10.12: Lagrange Error Bound BC ONLY	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.C: Determine the error bound associated with a Taylor polynomial approximation. BC ONLY	LIM-8.C.1	8.7, pp. 592-593
		LIM-8.C.2	8.9, p. 610 AP Exam Practice Questions for Chapter 8, p. 629, Exercise 9

Highlighting indicates topics and sections that are BC only.

Topic	Enduring Understanding and Learning Objective	Essential Knowledge	Text Section(s) & Page Number(s)
10.13: Radius and Interval of Convergence of Power Series BC ONLY	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.D: Determine the radius of convergence and interval of convergence for a power series. BC ONLY	LIM-8.D.1	8.8, p. 597
		LIM-8.D.2	8.8, pp. 598-599
		LIM-8.D.3	8.8, p. 599
		LIM-8.D.4	8.8, pp. 600-601
		LIM-8.D.5	8.10, pp. 614-615
		LIM-8.D.6	8.8, pp. 602-603
10.14: Finding Taylor or Maclaurin Series for a Function BC ONLY	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.E: Represent a function as a Taylor series or a Maclaurin series. BC ONLY	LIM-8.E.1	8.10, pp. 614-616
		LIM-8.F.1	8.9, p. 607
	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.F: Interpret Taylor series and Maclaurin series. BC ONLY	LIM-8.F.2	8.10, pp. 617-622
		LIM-8.G.1	8.9, pp. 607-611
10.15: Representing Functions as Power Series BC ONLY	LIM-8: Power series allow us to represent associated functions on an appropriate interval. LIM-8.G: Represent a given function as a power series. BC ONLY	LIM-8.G.1	8.9, pp. 607-611

Highlighting indicates topics and sections that are BC only.