

## AP CALCULUS BC

# AP Pacing Guide for Flipped Classrooms: Jan.–April 2021

## ! Overview

Due to the challenges associated with hybrid and remote learning in 2020–21, a significant amount of the content and skills colleges are requiring for credit will likely need to be assigned to students as homework or independent learning. This guide allows students who are currently behind to complete all course topics from the course and exam description by May. This guide assumes students will complete approximately 30 minutes of AP Daily videos (~10 minutes each) and topic questions each day in lieu of, or addition to, assignments the teacher would ordinarily give.

## 📅 How to Implement





This guide assumes students covered only ~27% of the course content and skills in the fall of 2020. For classes that have been forced off schedule, there may not be time for teacher-led instruction of all remaining topics.

- Teachers should **assign the AP Daily videos and topic questions** listed below as student assignments each week.
- Using the reports generated by the topic questions, teachers should focus their limited, direct class time on the Learning Objectives where students need more help.
- If students are ahead of the pace indicated below, teachers will be able to incorporate additional days or weeks to spend more time on challenging topics, practicing course skills, or reviewing for the exam.








## 📅 Week 1: Jan. 4–8

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
5.1 Using the Mean Value Theorem	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	FUN-1.B: Justify conclusions about functions by applying the Mean Value Theorem over an interval.	💡 Topic Questions
5.2 Extreme Value Theorem, Global Versus Local Extrema, and Critical Points	AP Daily Video 1 AP Daily Video 2	FUN-1.C: Justify conclusions about functions by applying the Extreme Value Theorem.	💡 Topic Questions





\*Prioritize the most challenging Learning Objectives for your students for direct, synchronous instruction.

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
5.3 Determining Intervals on Which a Function Is Increasing or Decreasing	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.4 Using the First Derivative Test to Determine Relative (Local) Extrema	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.5 Using the Candidates Test to Determine Absolute (Global) Extrema	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.6 Determining Concavity of Functions over Their Domains	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions




 **Week 2: Jan. 11–15**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
5.7 Using the Second Derivative Test to Determine Extrema	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.8 Sketching Graphs of Functions and Their Derivatives	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.9 Connecting a Function, Its First Derivative, and Its Second Derivative	AP Daily Video 1 AP Daily Video 2	FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.	 Topic Questions
5.10 Introduction to Optimization Problems	AP Daily Video 1 AP Daily Video 2	FUN-4.B: Calculate minimum and maximum values in applied contexts or analysis of functions.	 Topic Questions
5.11 Solving Optimization Problems	AP Daily Video 1	FUN-4.C: Interpret minimum and maximum values calculated in applied contexts.	 Topic Questions
5.12 Exploring Behaviors of Implicit Relations	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	FUN-4.D: Determine critical points of implicit relations. FUN-4.E: Justify conclusions about the behavior of an implicitly defined function based on evidence from its derivatives.	 Topic Questions  Personal Progress Check





 **Week 3: Jan. 18–22**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
6.1 Exploring Accumulations of Change	AP Daily Video 1 AP Daily Video 2	CHA-4.A: Interpret the meaning of areas associated with the graph of a rate of change in context.	 Topic Questions
6.2 Approximating Areas with Riemann Sums	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	LIM-5.A: Approximate a definite integral using geometric and numerical methods.	 Topic Questions
6.3 Riemann Sums, Summation Notation, and Definite Integral Notation	AP Daily Video 1 AP Daily Video 2	LIM-5.B: Interpret the limiting case of the Riemann sum as a definite integral. LIM-5.C: Represent the limiting case of the Riemann sum as a definite integral.	 Topic Questions
6.4 The Fundamental Theorem of Calculus and Accumulation Functions	AP Daily Video 1 AP Daily Video 2	FUN-5.A: Represent accumulation functions using definite integrals.	 Topic Questions





 **Week 4: Jan. 25–29**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
6.5 Interpreting the Behavior of Accumulation Functions Involving Area	AP Daily Video 1 AP Daily Video 2	FUN-5.A: Represent accumulation functions using definite integrals.	 Topic Questions
6.6 Applying Properties of Definite Integrals	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	FUN-6.A: Calculate a definite integral using areas and properties of definite integrals.	 Topic Questions
6.7 The Fundamental Theorem of Calculus and Definite Integrals	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	FUN-6.B: Evaluate definite integrals analytically using the Fundamental Theorem of Calculus.	 Topic Questions






 **Week 5: Feb. 1–5**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
6.8 Finding Antiderivatives and Indefinite Integrals—Basic Rules and Notation	AP Daily Video 1 AP Daily Video 2	FUN-6.C: Determine antiderivatives of functions and indefinite integrals, using knowledge of derivatives.	 Topic Questions
6.9 Integrating Using Substitution	AP Daily Video 1 AP Daily Video 2	FUN-6.D: For integrands requiring substitution or rearrangements into equivalent forms: a. Determine indefinite integrals. b. Evaluate definite integrals.	 Topic Questions
6.10 Integrating Functions Using Long Division and Completing the Square	AP Daily Video 1 AP Daily Video 2	FUN-6.D: For integrands requiring substitution or rearrangements into equivalent forms: a. Determine indefinite integrals. b. Evaluate definite integrals.	 Topic Questions
6.11 Integrating Using Integration by Parts	AP Daily Video 1 AP Daily Video 2 AP Daily Video 3	FUN-6.E: For integrands requiring integration by parts: (a) Determine indefinite integrals. (b) Evaluate definite integrals.	 Topic Questions






 **Week 6: Feb. 8–12**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
6.12 Using Linear Partial Fractions	AP Daily Video 1	FUN-6.F: For integrands requiring integration by linear partial fractions: (a) Determine indefinite integrals. (b) Evaluate definite integrals.	 Topic Questions
6.13 Evaluating Improper Integrals	AP Daily Video 1 AP Daily Video 2	LIM-6.A: Evaluate an improper integral or determine that the integral diverges.	 Topic Questions
6.14 Selecting Techniques of Antidifferentiation	AP Daily Video 1 AP Daily Video 2	See page 128 of the course and exam description for more information on Topic 6.14.	 Topic Questions  Personal Progress Check

## Week 7: Feb. 15–19

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
7.1 Modeling Situations with Differential Equations	AP Daily Video TBD	FUN-7.A: Interpret verbal statements of problems as differential equations involving a derivative expression.	 Topic Questions
7.2 Verifying Solutions for Differential Equations	AP Daily Video TBD	FUN-7.B: Verify solutions to differential equations.	 Topic Questions
7.3 Sketching Slope Fields	AP Daily Video TBD	FUN-7.C: Estimate solutions to differential equations.	 Topic Questions
7.4 Reasoning Using Slope Fields	AP Daily Video TBD	FUN-7.C: Estimate solutions to differential equations.	 Topic Questions
7.5 Approximating Solutions Using Euler's Method	AP Daily Video TBD	FUN-7.C: Estimate solutions to differential equations.	 Topic Questions









## Week 8: Feb. 22–26

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
7.6 Finding General Solutions Using Separation of Variables	AP Daily Video TBD	FUN-7.D: Determine general solutions to differential equations.	 Topic Questions
7.7 Finding Particular Solutions Using Initial Conditions and Separation of Variables	AP Daily Video TBD	FUN-7.E: Determine particular solutions to differential equations.	 Topic Questions
7.8 Exponential Models with Differential Equations	AP Daily Video TBD	FUN-7.F: Interpret the meaning of a differential equation and its variables in context. FUN-7.G: Determine general and particular solutions for problems involving differential equations in context.	 Topic Questions
7.9 Logistic Models with Differential Equations	AP Daily Video TBD	FUN-7.H: Interpret the meaning of the logistic growth model in context.	 Topic Questions  Personal Progress Check






**Week 9: Mar. 1–5**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
8.1 Finding the Average Value of a Function on an Interval	AP Daily Video TBD	CHA-4.B: Determine the average value of a function using definite integrals.	Topic Questions
8.2 Connecting Position, Velocity, and Acceleration of Functions Using Integrals	AP Daily Video TBD	CHA-4.C: Determine values for positions and rates of change using definite integrals in problems involving rectilinear motion.	Topic Questions
8.3 Using Accumulation Functions and Definite Integrals in Applied Contexts	AP Daily Video TBD	CHA-4.D: Interpret the meaning of a definite integral in accumulation problems. CHA-4.E: Determine net change using definite integrals in applied contexts.	Topic Questions
8.4 Finding the Area Between Curves Expressed as Functions of $x$	AP Daily Video TBD	CHA-5.A: Calculate areas in the plane using the definite integral.	Topic Questions
8.5 Finding the Area Between Curves Expressed as Functions of $y$	AP Daily Video TBD	CHA-5.A: Calculate areas in the plane using the definite integral.	Topic Questions
8.6 Finding the Area Between Curves That Intersect at More Than Two Points	AP Daily Video TBD	CHA-5.A: Calculate areas in the plane using the definite integral.	Topic Questions






 **Week 10: Mar. 8–12**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
8.7 Volumes with Cross-Sections—Squares and Rectangles	AP Daily Video TBD	CHA-5.B: Calculate volumes of solids with known cross sections using definite integrals.	 Topic Questions
8.8 Volumes with Cross-Sections—Triangles and Semicircles	AP Daily Video TBD	CHA-5.B: Calculate volumes of solids with known cross sections using definite integrals.	 Topic Questions
8.9 Volume with Disc Method—Revolving Around the x- or y-Axis	AP Daily Video TBD	CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	 Topic Questions
8.10 Volume with Disc Method—Revolving Around Other Axes	AP Daily Video TBD	CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	 Topic Questions
8.11 Volume with Washer Method—Revolving Around the x- or y-Axis	AP Daily Video TBD	CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	 Topic Questions
8.12 Volume with Washer Method—Revolving Around Other Axes	AP Daily Video TBD	CHA-5.C: Calculate volumes of solids of revolution using definite integrals.	 Topic Questions
8.13 The Arc Length of a Smooth, Planar Curve and Distance Traveled	AP Daily Video TBD	CHA-6.A: Determine the length of a curve in the plane defined by a function, using a definite integral.	 Topic Questions  Personal Progress Check






 **Week 11: Mar. 15–19**

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
9.1 Defining and Differentiating Parametric Equations	AP Daily Video TBD	CHA-3.G: Calculate derivatives of parametric functions.	 Topic Questions
9.2 Second Derivatives of Parametric Equations	AP Daily Video TBD	CHA-3.G: Calculate derivatives of parametric functions.	 Topic Questions
9.3 Finding Arc Lengths of Curves Given by Parametric Equations	AP Daily Video TBD	CHA-6.B: Determine the length of a curve in the plane defined by parametric functions, using a definite integral.	 Topic Questions
9.4 Defining and Differentiating Vector-Valued Functions	AP Daily Video TBD	CHA-3.H: Calculate derivatives of vector-valued functions.	 Topic Questions
9.5 Integrating Vector-Valued Functions	AP Daily Video TBD	FUN-8.A: Determine a particular solution given a rate vector and initial conditions.	 Topic Questions

 **Week 12: Mar. 22–26**






Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
9.6 Solving Motion Problems Using Parametric and Vector-Valued Functions	AP Daily Video TBD	FUN-8.B: Determine values for positions and rates of change in problems involving planar motion.	 Topic Questions
9.7 Defining Polar Coordinates and Differentiating in Polar Form	AP Daily Video TBD	FUN-3.G: Calculate derivatives of functions written in polar coordinates.	 Topic Questions
9.8 Find the Area of a Polar Region or the Area Bounded by a Single Polar Curve	AP Daily Video TBD	CHA-5.D: Calculate areas of regions defined by polar curves using definite integrals.	 Topic Questions
9.9 Finding the Area of the Region Bounded by Two Polar Curves	AP Daily Video TBD	CHA-5.D: Calculate areas of regions defined by polar curves using definite integrals.	 Topic Questions  Personal Progress Check

 **Week 13: Mar. 29–Apr. 2**







Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
10.1 Defining Convergent and Divergent Infinite Series	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.2 Working with Geometric Series	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.3 The $n$ th Term Test for Divergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.4 Integral Test for Convergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.5 Harmonic Series and $p$ -Series	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions



## Week 14: Apr. 5–9

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
10.6 Comparison Tests for Convergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.7 Alternating Series Test for Convergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.8 Ratio Test for Convergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.9 Determining Absolute or Conditional Convergence	AP Daily Video TBD	LIM-7.A: Determine whether a series converges or diverges.	 Topic Questions
10.10 Alternating Series Error Bound	AP Daily Video TBD	LIM-7.B: Approximate the sum of a series.	 Topic Questions

## Week 15: Apr. 12–16

Topic	Recommended Asynchronous Student Assignments	Options for Synchronous Instructional Focus*	Check for Understanding
10.11 Finding Taylor Polynomial Approximations of Functions	AP Daily Video TBD	LIM-8.A: Represent a function at a point as a Taylor polynomial. LIM-8.B: Approximate function values using a Taylor polynomial.	 Topic Questions
10.12 Lagrange Error Bound	AP Daily Video TBD	LIM-8.C: Determine the error bound associated with a Taylor polynomial approximation.	 Topic Questions
10.13 Radius and Interval of Convergence of Power Series	AP Daily Video TBD	LIM-8.D: Determine the radius of convergence and interval of convergence for a power series.	 Topic Questions
10.14 Finding Taylor or Maclaurin Series for a Function	AP Daily Video TBD	LIM-8.E: Represent a function as a Taylor series or a Maclaurin series. LIM-8.F: Interpret Taylor series and Maclaurin series.	 Topic Questions
10.15 Representing Functions as Power Series	AP Daily Video TBD	LIM-8.G: Represent a given function as a power series.	 Topic Questions  Personal Progress Check