

Calculus AB Essential Standards

Unit 1 - Limits and Continuity

I can describe the behaviors of functions through an analysis of limits.

I can identify when a function has discontinuities (including the type), and I can “fix” the discontinuity, if possible.

Unit 2 - Differentiation: Definition and Fundamental Properties

I can use the definition and basic rules of derivatives to determine change at an instant or a function that describes the instantaneous rate of change of every point on a function.

Unit 3 - Differentiation: Composite, Implicit, Inverse Functions

I can extend my knowledge of differentiation to calculate derivatives of composite, implicit, and inverse functions.

Unit 4 - Contextual Applications of Differentiation

I can use my knowledge of derivatives to solve problems in a real-world context.

Unit 5 - Analytical Applications of Differentiation

I can use my knowledge of derivatives to analyze the shape and behaviors of functions.

Unit 6 - Integration and Accumulation of Change

I can connect differentiation to integration and use the accumulation function to solve problems.

I can select the appropriate strategy to evaluate an integral (both definite and indefinite).

Unit 7 - Differential Equations

I can model and solve problems using differential equations.

Unit 8 - Applications of Integration

I can use my knowledge of integration to solve problems, both with real world and analytical contexts.

Calculus BC Essential Standards

All the same as above, plus...

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

I can extend my knowledge of derivatives to solve problems involving parametrics, polars, and vector-valued functions.

I can extend my knowledge of integration to solve problems involving parametrics, polars, and vector-valued functions.

Unit 10 - Infinite Sequences and Series

I can select the appropriate strategy/test to determine if a series converges (and if possible, find the sum)

I can represent functions as series.

Learning Objectives

Unit 1 - Limits and Continuity

I can...

CHA-1.A: Interpret the rate of change at an instant in terms of AROC over intervals containing that instant.

LIM-1.A: Represent limits analytically using correct notation.

LIM-1.B: Interpret limits expressed in analytic notation.

LIM-1.C: Estimate limits of functions.

LIM-1.D: Determine the limits of functions using limit theorems.

LIM-1.E: Determine the limits of functions using equivalent expressions for the function or the squeeze theorem.

LIM-2.A: Justify conclusions about continuity at a point using the definition.

LIM-2.B: Determine intervals over which a function is continuous.

LIM-2.C: Determine values of x or solve for parameters that make discontinuous functions continuous, if possible.

LIM-2.D: Interpret the behavior of functions using limits involving infinity.

FUN-1.A: Explain the behavior of a function on an interval using the Intermediate Value Theorem.

Unit 2 - Differentiation: Definition and Fundamental Properties

I can...

CHA-2.A: Determine average rates of change using difference quotients.

CHA-2.B: Represent the derivative of a function as the limit of a difference quotient.

CHA-2.C: Determine the equation of a line tangent to a curve at a given point.

CHA-2.D: Estimate derivatives.

FUN-2.A: Explain the relationship between differentiability and continuity.

FUN-3.A: Calculate derivatives of familiar functions.

LIM-3.A: Interpret a limit as a definition of a derivative.

FUN-3.B: Calculate derivatives of products and quotients of differentiable functions.

Unit 3 - Differentiation: Composite, Implicit, Inverse Functions

I can...

FUN-3.C: Calculate derivatives of compositions of differentiable functions.

FUN-3.D: Calculate derivatives of implicitly defined functions.

FUN-3.E: Calculate derivatives of inverse and inverse trigonometric functions.

FUN-3.F: Determine higher order derivatives of a function.

Unit 4 - Contextual Applications of Differentiation

I can...

CHA-3.A: Interpret the meaning of the derivative in context.

CHA-3.B: Calculate rates of change in applied contexts.

CHA-3.C: Interpret rates of change in applied contexts.

CHA-3.D: Calculate related rates in applied contexts.

CHA-3.E: Interpret related rates in applied contexts.

CHA-3.F: Approximate a value on a curve using the equation of a tangent line.

LIM-4.A: Determine limits of functions that result in indeterminate forms.

Unit 5 - Analytical Applications of Differentiation

I can...

FUN-1.B: Justify conclusions about functions by applying the Mean Value Theorem over an interval.

FUN-1.C: Justify conclusions about functions by applying the Extreme Value Theorem.

FUN-4.A: Justify conclusions about the behavior of a function based on the behavior of its derivatives.

FUN-4.B: Calculate minimum and maximum values in applied contexts or analysis of functions.

FUN-4.C: Interpret minimum and maximum values calculated in applied contexts.

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.

Unit 6 - Integration and Accumulation of Change

I can...

CHA-4.A: Interpret the meaning of areas associated with the graph of a rate of change in context.

LIM-5.A: Approximate a definite integral using geometric and numerical methods.

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.

FUN-5.A: Represent accumulation functions using definite integrals.

FUN-6.A: Calculate a definite integral using areas and properties of definite integrals.

FUN-6.B: Evaluate definite integrals analytically using the Fundamental Theorem of Calculus

FUN-6.C: Determine antiderivatives of functions and indefinite integrals, using knowledge of derivatives.

FUN-6.D: For integrands requiring substitution or rearrangement into equivalent forms:

- Determine indefinite integrals
- Evaluate definite integrals

Unit 7 - Differential Equations

I can...

FUN-7.A: Interpret verbal statements of problems as differential equations involving a derivative expression.

FUN-7.B: Verify solutions to differential equations.

FUN-7.C: Estimate solutions to differential equations.

FUN-7.D: Determine general solutions to differential equations.

FUN-7.E: Determine particular solutions to differential equations.

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.

Unit 8 - Applications of Integration

I can...

CHA-4.B: Determine the average value of a function using definite integrals.

CHA-4.C: Determine values for positions and rates of change using definite integrals in problems involving rectilinear motion.

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.

CHA-5.A: Calculate areas in the plane using the definite integral.

CHA-5.B: Calculate volumes of solids with known cross sections using definite integrals.

CHA-5.C: Calculate volumes of solids of revolution using definite integrals.

BC Only

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

I can...

CHA-3.G: Calculate derivatives of parametric functions.

CHA-3.H: Calculate derivatives of vector-valued functions.

FUN-3.G: Calculate derivatives of functions written in polar coordinates.

CHA-5.D: Calculate areas of regions defined by polar curves using definite integrals.

CHA-6.A: Determine the length of a curve in the plane defined by a function, using a definite integral.

CHA-6.B: Determine the length of a curve in the plane defined by parametric functions, using a definite integral.

LIM-6.A: Evaluate an improper integral or determine that the integral diverges.

FUN-6.E: For integrands requiring integration by parts:

(a) Determine indefinite integrals

(b) Evaluate definite integrals

FUN-6.F: For integrands requiring integration by linear partial fractions:

(a) Determine indefinite integrals

(b) Evaluate definite integrals

FUN-7.H: Interpret the meaning of the logistic growth model in context.

FUN-8.A: Determine a particular solution given a rate vector and initial conditions.

FUN-8.B: Determine values for positions and rates of change in problems involving planar motion.

Unit 10 - Infinite Sequences and Series

I can...

LIM-7.A: Determine whether a series converges or diverges.

LIM-7.B: Approximate the sum of a series.

LIM-8.A: Represent a function at a point as a Taylor polynomial.

LIM-8.B: Approximate function values using a Taylor polynomial.

LIM-8.C: Determine the error bound associated with a Taylor polynomial approximation.

LIM-8.D: Determine the radius of convergence and interval of convergence for a power series.

LIM-8.E: Represent a function as a Taylor series or a Maclaurin series.

LIM-8.F: Interpret Taylor series and Maclaurin series.

LIM-8.G: Represent a given function as a power series.