

# Unit 1 Functions, Graphs, and Limits

Content Area: **Mathematics**  
Course(s): **AP Calculus AB**  
Time Period: **September**  
Length: **3 weeks**  
Status: **Published**

## Enduring Understandings

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Algebra, trigonometry, and logarithms are essential tools for the study of calculus.

The concept of a limit is one of the foundations of calculus.

Continuous functions model real-life phenomena.

## Essential Questions

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How does the math that you previously studied relate to the math that you are going to be studying?

How do limits guarantee the continuity of a function?

When do limits fail to exist?

How are limits connected to the existence of vertical and horizontal asymptotes?

What is the difference between calculating a limit and evaluating a function at a point?

What are connections among these presentations of functions; graphically, numerically, analytically or verbally?

## Content

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### Red Hot Topics:

- \* Rational Exponents
- \* Simplifying expressions
- \* Writing linear equations
- \* Average rate of change

## Vocabulary

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Domain, range, independent, dependent variable, graph, function, absolute value, increasing, decreasing, linear, quadratic, polynomial, coefficients, degree, cubic, power, root, reciprocal, rational, algebraic, trigonometric, exponential, logarithmic, translations, composite, limit, right-hand limit, left-hand limit, vertical asymptote, continuous at a point, discontinuity, removable discontinuity, jump discontinuity, horizontal asymptote, infinite limits, limits at infinity,

intermediate value theorem.

## **Skills**

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Evaluate functions using function notation  
Determine the domain and range of a function  
Explain the characteristics of a graph of a function including local and global behavior  
Apply the rules for transformations of a function  
Categorize classifications and combinations of functions  
Find limits: graphically, numerically, analytically  
Identify limits that fail to exist  
Construct an informal definition of limit  
Identify properties of limits  
Formulate a strategy for finding limits  
Analyze cancellation and rationalization techniques  
Apply the Squeeze Theorem for evaluating limits  
Apply and categorize properties of continuity  
Apply the Intermediate Value Theorem  
Define and apply the concept of infinite limits and limits at infinity.  
Identify vertical and horizontal asymptotes

## **Standards**

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Unit 1: Collegeboard AP Calculus Standards

Students should be able to work with functions represented in a variety of ways: graphical, numerical, analytical, or verbal. They should understand the connections among these representations.

Student should be able to model a written description of a physical situation with a function, limit, differential equation, or an integral.

Student should be able to communicate mathematics and explain solutions to problems both verbally and in written sentences.

Students should be able to use technology to help solve problems, experiment, interpret results, and support conclusions.

Students should be able to determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.

Student should develop an appreciation of Calculus as a coherent body of knowledge and human accomplishment.