

---

## AP Calculus      Prerequisites

Before studying calculus, all students should complete four years of secondary mathematics designed for college-bound students: courses in which they study algebra, geometry, trigonometry, analytic geometry, and elementary functions. These functions include those that are linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric, and piecewise defined. In particular, before studying calculus, students must be familiar with the properties of functions, the algebra of functions, and the graphs of functions. Students must also understand the language of functions (domain and range, odd and even, periodic, symmetry, zeros, intercepts, and so on) and know the values of the trigonometric functions of the numbers 0,  $\pi/6$ ,  $\pi/4$ ,  $\pi/3$ ,  $\pi/2$ , and their multiples.

### Some of the required pre-requisite topics include:

1. The real number line: families of numbers, interval notation, union and intersection of sets.
2. Simplifying algebraic expressions, solving absolute value inequalities.
3. New functions from old: transformations, sum, difference, quotient, product, composition, inverses, and the related domain and range.
4. Domain, range, zeros, factoring, and sketching guidelines for polynomial, exponential, logarithmic, trigonometric (sine, cosine, tangent, secant, cosecant, cotangent, arcsine, arccosine, arctangent) functions.
5. Rational functions: long and synthetic division, factoring, sketching, end behavior, asymptotes (horizontal, vertical, slant), factor and remainder theorems.
6. The unit circle, radians vs. degrees, transformations of trigonometric functions, period, amplitude.
7. Trigonometry of right triangles: Sine Rule, Cosine Rule (applications), Arc Length and area of a sector, Double angle and half angle formulae, the sine, cosine, and tangent of sums and differences of angles.
8. Trigonometric Identities: proofs.
9. Exponential and Logarithmic Functions: sketching guidelines, properties of logarithms, half-life, doubling time, applications: exponential decay and population growth, compound vs continuous interest.
11. Average rate of change of a function.
12. Volumes and surface area of known solids: sphere, cylinder, cone
13. Circles and ellipses.
14. Techniques for finding limits: numerically, graphically, algebraically, and verbally.