Calculus is a branch of mathematics that involves the study of rates of change. Before calculus was invented, all math was static: It could only help calculate objects that were perfectly still. But the universe is constantly moving and changing. No objects—from the stars in space to subatomic particles or cells in the body—are always at rest. Indeed, just about everything in the universe is constantly moving. Calculus helped to determine how particles, stars, and matter actually move and change in real time.

Calculus is used in a multitude of fields that you wouldn't ordinarily think would make use of its concepts. Among them are physics, engineering, economics, statistics, and medicine. Calculus is also used in such disparate areas as space travel, as well as determining how medications interact with the body, and even how to build safer structures. You'll understand why calculus is useful in so many areas if you know a bit about its history as well as what it is designed to do and measure.

### Key Takeaways: Fundamental Theorem of the Calculus

* Calculus is the study of rates of change.
* Gottfried Leibniz and Isaac Newton, 17th-century mathematicians, both invented calculus independently. Newton invented it first, but Leibniz created the notations that mathematicians use today.
* There are two types of calculus: Differential calculus determines the rate of change of a quantity, while integral calculus finds the quantity where the rate of change is known.

## Who Invented Calculus?

Calculus was developed in the latter half of the 17th century by two mathematicians, Gottfried Leibniz and [Isaac Newton](https://www.thoughtco.com/biography-sir-isaac-newton-4072880). Newton first developed calculus and applied it directly to the understanding of physical systems. Independently, Leibniz developed the notations used in calculus. Put simply, while basic math uses operations such as plus, minus, times, and division (+, -, x, and ÷), calculus uses operations that employ [functions and integrals](https://www.thoughtco.com/calculations-with-the-gamma-function-3126261) to calculate rates of change.

Those tools allowed Newton, Leibniz, and other mathematicians who followed to calculate things like the exact slope of a curve at any point. [The Story of Mathematics](http://www.storyofmathematics.com/17th_newton.html) explains the importance of Newton's fundamental theorem of the calculus:

"Unlike the static geometry of the Greeks, calculus allowed mathematicians and engineers to make sense of the motion and dynamic change in the changing world around us, such as the orbits of planets, the motion of fluids, etc."

Using calculus, scientists, astronomers, physicists, mathematicians, and chemists could now chart the orbit of the planets and stars, as well as the path of electrons and protons at the atomic level.