

Interesting facts about Calculus

Calculus is not just an old mathematical discipline collecting old dust. It provides us with an understanding of how things move and change on earth, such as rockets going to outer-space, change in the stock market every day, and more everyday events such as the speed of a car on the highway. If something's not sitting still, calculus can help us to understand it.

Calculus started in the 1600s when both Isaac Newton and Gottfried Wilhelm Leibniz developed a mathematical method to track how things change or move through time. This discovery did not stay hidden. It spread rapidly and Newton's and Leibniz's mathematics is still applied to everything from building and construction (bridges) to developing complex sales/expenditure models in the economy.

In general terms, the core principles of calculus can be divided into two major areas: differential and integral calculus. One area of differential calculus looks at how quickly change is occurring. For instance, what is an object's acceleration? or how fast is that object cooling? The area of integral calculus sums all the infinitesimally small pieces of something together to find the total. For instance, how far is a person running when they run 1 mile? or how much water has flowed through a pipe? When solving real-world problems, the different branches of calculus are often solved together.

The world has twists and turns. It wasn't until we applied limits that we could understand what was happening at a particular point by zooming into a curve. Regular algebra can't provide that level of detail and only gives you information about the curve as a whole.

Tangents are more challenging to calculate than slopes of straight lines because of the non-linear structure of curves; however, calculus will enable you to get an exact tangent line to the curve at one point (the tangent line touches but does not intersect the curve at that point). Through the use of the derivative, you will find the slope of the tangent line to find the exact rate of change of the curve at that point in time.

When we move into the world of integral calculus, we experience a shift in concept from zooming in on data to summing up all of the infinitely small increments to find out how much total data there is. Instead of looking merely at the rate of change of the data at the current moment, we also want to know how much total data there is within the accumulated sum of data. When you are determining the area under an irregular curve, you are adding up an infinite number of infinitely small slivers (the sum of the areas of each sliver equals the area of the curve). This may sound theoretical to you, but each time that you sum up individual data points or extrapolate how much total data there is from a graph, you have performed integration. A good example of this would be plotting your velocity over time. When you calculate your distance traveled over time, you use the area beneath that curve that is made up of skinny rectangles that you can simply add together to give you the total distance traveled.

The glue that holds it all together is the Fundamental Theorem of Calculus. This is where the magic occurs; differentiation and integration seem like opposites, but they are actually closely related; differentiation takes things apart and integration puts things back together. This process of going from differentiation to integration is the basis of almost all engineering and scientific applications.

Calculus is found outside of the classroom in real world applications as well. Physics relies on it heavily, as Newton's laws are based on calculus. Engineers utilize calculus in designing everything from buildings to computer chips to GPS systems. So when people require precise and adaptable solutions to a problem, calculus provides the engine typically used behind the scenes.

In addition to physics and engineering, calculus also plays an important role in business and economics. It provides solutions for determining marginal cost and profit associated with small changes in a variable. Companies utilize calculus to set prices, estimate revenue, and make better critical decisions regarding their business activities.

There are several applications of calculus in biology and medicine as well. One aspect of calculus is to model how bacteria multiply, how diseases spread through a population within a city, and how medicines are absorbed by an individual's body. Epidemiologists rely on calculus for predicting and managing disease outbreaks and trends.

Even though most people do not calculate derivatives in their heads on a daily basis, calculus is always "lurking" somewhere in the background; for example, when you're using a GPS app or estimating the driving time from one place to another. Calculus is part of our everyday lives; it is mostly "invisible" to us; however, it is "critical".

So what is it about calculus that makes it difficult for people? In all honesty calculus requires a new way of thinking; i.e.; thinking in terms of "infinity"; taking things down into the smallest pieces possible. At first, these ideas will seem awkward; however, as you use them more, you will begin to get used to them. The "secret" is that the way calculus teaches you to break problems into individual pieces, sort through the pieces, and put the pieces back together, will help you with every type of problem not just in mathematics.

Calculus is just the beginning! The tools and techniques learned in calculus will enable you to work on more advanced subjects such as differential equations, multivariable calculus, and mathematical analysis. These are very important tools that we need to solve many of the most difficult problems in the fields of science and technology.

Computer science and artificial intelligence are now made up of calculus in almost every regard. Training your computer to find patterns in data is an example of calculus at work, too, working behind the scenes to fine-tune and adjust everything.

Calculus can also be found in everyday life and in large-scale scientific discoveries that help us understand the world and how we are connected to one another. The learning curve can be steep, but once you get comfortable with the concepts of calculus, you will suddenly have a clearer understanding of how the world works. If you want to better understand everything around you and push the limits of what we can do as a species, you will find calculus the key to solving those problems. In addition, as the pace of life continues to increase, the ability to manage and adapt to change is no longer just beneficial it is necessary. Calculus provides you with a means to measure up to the challenge.