History of Calculus

Let's start with the definition of mathematics and calculus.

Mathematics – from the Greek knowledge, study learning. Is the study of quantity, structure, space and change.

Calculus (Latin, calculus, a small stone used for counting) is a branch of mathematics focused on limits, functions, derivatives, integrals, and infinite series. Is the mathematics of instantaneous rates of change – how rapidly is some particular quantity changing at this very instant? Calculus has two main branches. Differential calculus provides methods for calculating rates of change and it has many geometric applications, in particular finding tangents to curves. Integral calculus does the opposite: give the rates of chance of some quantity, it specifies the quantity itself. Geometric applications of integral calculus include the computation of areas and volumes. Perhaps the most significant is this unexpected connection between two apparently unrelated classical geometric questions: finding tangents to a curve and finding areas.

Why do we have to learn mathematics?

Where mathematics came from?

Mathematics came from our imagination; it is a complete invention of the human brain. With the invention of mathematics we create science. Mathematics makes up human, because it's a distinction that we have from all others animals in the animal's kingdom.

The important of mathematics and science is so great that no person living in the twentieth century can claim to be educated if they are unaware of the modern vision of the physical universe and the history of the magnificent concepts that it embodies.

Science is not rigid. Dogmas are rigid.

We should understand that science is the business of measuring things. Science constructs a model of the universe only from those things that is able to measure. The model of the universe, the cosmology that science creates, is base on what science is able to measure. It is that fallacy of misplaced concreteness, then to proclaim that this model is not untrue, but only partial, not all inclusive. If the model were complete, and scientist believed it to be complete, the business of science would come to and abrupt halt. Total truth has not yet been discovered.

In August 1684, Edmond Halley visited Newton to ask how he explained that the planets ('wandering star") keep in orbit. Three months later Newton invented Calculus. Other stories said that Newton already has invented calculus.

Newton turned calculus into a central technique of the budding subject of mathematical physics, humanity's most effective know route to the understanding of the natural world. Newton called this theory "The System of the World".

Bishop George Berkeley in his 1734 book, The Analyst, a Discourse to the Infidel Mathematician point out that it is illogical to divide numerator and denominator by o when later o y set to be cero. o/o take more than 100 year to solve this problem.

The German mathematician Karl Weierstrass was the first to produce a completely satisfactory definition of the limit of a series.

Leibniz visited Paris in 1672 and London 1673; Newton had sent a copy of the On Analysis to Barrow in 1669, and Leibniz talked to several people who also knew Barrow and so might have known about his work.

When Leibniz published his work in 1684, some of Newton's friends took umbrage – probably because Newton had been pipped to the publication post and they all belatedly realized what was at stake – accused Leibniz of stealing Newton ideas. The continental mathematicians, especially the Bernoulli's, leaped to Leibniz's defense, suggesting that is was Newton, not Leibniz, who was guilty of plagiarism. In point of fact, both men had made their discoveries pretty much independently, as their unpublished manuscript show. Both have learned heavily on previous work of Barrow, who probably had better grounds for grievance that either of them.

The dispute get worst resulted in a disaster for English mathematics, because they get stuck with Newton's geometric style of thinking, which was difficult to use, whereas the continental analysts employed Leibniz more formal, algebraic methods, and pushed the subject ahead at rapid pace.

Neither man's publications were easy to follow. In addition to being the greatest book on science, Newton's Principia has also been called "one of the most inaccessible book ever written". And Leibniz work, according to one Jakob Bernoulli's biographers, was understood by no one"; scholars have speculated that both author might have intentionally made their works difficult to understand to keep amateurs from dabbling.

List of mathematicians that contribute to the develop of Calculus.

Johannes Kepler (1570 - 1630)

Rene Descartes (1596 – 1650)

Bonaventura Cavaleri (1598 – 1647)

Pierre de Fermat (1601 – 1665)

Evangilista Torricelli (1608 – 1647)

John Wallis (1616 – 1703)

Gottfried Leibniz (1646 – 1716)

Isaac Newton (1642 – 1727)

Michel Rolle (1652 – 1718)

James Bernoulli (1654 – 1705)

Guillaume de l'Hospital

John Bernoulli (1667 – 1748)

Brook Taylor (1685 – 1731)

Colin MacLaurin (1698 – 1746)

Leonhard Euler (1707 – 1783)

Thomas Simpson (1710 -1761)

Joseph Louis Lagrange (1736 – 1813)

Pierre Simon Laplace (1749 – 1827)

Jean Baptiste Joseph Fourier (1768 – 1830)

Carl Fredrich Gauss (1777 – 1855)

Augustin-Louis Cauchy (1789 -1857)

August Ferdinand Mobius (1790 – 1868)

George Green (1793 – 1841)

William Rowan Hamilton (1805 – 1865)

Pierre Verhulst (1804 - 1849)

Carl Justav Jacobi (1804 – 1851)

Karl Weierstarss (1815 – 1897)

George Gabriel Stokes (1819 – 1903)

Bernhard Riemann (1826 – 1866)

Josiah Willard Gibbs (1839 – 1903)

Georg Ferdinand Ludwig Philipp Cantor (1845 – 1918)

Guido Fubini (1879 – 1943)

Sricivasa Ramanujan (1887 – 1920)

Calculus

Early approaches to the problems of working with irregular shapes and volumes tried to divide the area of volumes into small parts them add together the parts. The essentials elements of this method were described by Eudozous and Archimedes more than 2,000 years ago, but rigorous development and application were not possible until 17th century.

$\sqrt{2}$, e, π are infinite series

Infinitely small (infinitesimal)

The Greeks dislike irrationals numbers.

Archimedes area of a circle (a so obtained the value of π) depend on drawing polygons inside and outside a circle and calculating the respective Area.

IMP – The weight of paper by Galileo to know the area of a curve.

The emergence of calculus. The invention of calculus was one of the great turning points in the history of mathematics. It tackled problems that had taxed mathematicians for 2,000 years.

Calculus provides a way of measuring rate of change.

Calculus is the latin name for small stone used for counting.

Jakob and Johann Bernoulli develop the rules for differentiation, the integration of rational function, the theory of elementary functions.

Mid 19th century Riemann verified the method of calculating and integral.