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# Sir Isaac Newton's Contribution to Calculus

Isaac Newton was "born on December 25, 1642 [January 4, 1643 New Style] in Woolsthorpe, Lincolnshire England"(1). He was the only son "of a local yeoman...who had died three months before [his birth]". When Newton went to school at Cambridge, he was "immersed in the works of Aristotle". Later on, Newton was introduced to the French philosopher René Descartes who had a different approach to the physical world. Descartes concluded that we are surrounded by "particles of matter in motion...the phenomena of nature result from their mechanical interaction"(1). This would later slingshot Newton into his research regarding physics and subsequently calculus to aid the latter journey.

In the world of mathematics, Isaac Newton has contributed greatly to the development of calculus by proposing the concept of derivatives. He stumbled upon this notion when he was trying to "find the slope at any point on a curve". He originally called this the "'method of fluxions'"(2) because it dealt with an instantaneous moment on the graph. This solved an issue that Newton was having which was that he could not give the slope of the curve at any point because it was constantly fluctuating. Newton also used his newly found discovery in his journey in Physics. Using the derivative of a graph would allow him to calculate the velocity, which is the rate of change a particle moves through space.

Notation of a derivative in calculus was actually a single dot over the "y" in an equation however "In Lagrange's notation the derivative of f(x) is expressed as f′, prime (pronounced 'f prime' )." This is used by most as it is easier to use and also to type as most typists of the time did not

have enough keys to accommodate for Newton's notation. Many other notations of derivatives are used, it is merely a preference of the individual.

One example of a derivative can be shown by using the function $f(x)=x^2+2x$ where we can apply the power rule by dropping the power term in front of the x term and subtracting the power by one. This can be applied for each term in the polynomial and the result would be $f'(x)=2x+2$ . This new equation will now allow us to tell how steep the graph at any given point.

Newton also discovered the idea of limits and how they pertain to tangent lines. In very basic sense, limits are a value that a function approaches "is the exact slope at a point"(2). This notion allows us to take derivatives, integrals and prove if a function is or is not continuous. In Newton's predecessor's did not in fact use this concept and it was from their works that Newton was able to formalize a concept of limits. Newton however did not dig very deep into limits and was left to other mathematicians of the time "clarify his ideas" about such a topic. This was also a concept that Newton incorporated into his theories in physics where it related to terminal speed/velocity. By using the limit definition, you would be able to calculate the speed at which an object will stop accelerating and maintain constant velocity. This function would incorporate air resistance and the speed at which the object was initially traveling at.

One example of a limit can be expressed as $\lim_{x\to 2}\frac{x+6}{x}$ . This means that as the function approaches 2, the function will approach a given value. The first thing to do would be to substitute the value of x into the function and see if that would result in a number. When we do that, the answer would be 4. So, as this function approaches 2, the slope of that x-value would be 4. Some problems do not have the same luxury of an answer that is not indeterminant and require a bit more tweaking with a theorem created by another mathematician.

By far the most notable thing about Newton is the controversy in which he caused when he formally proposed his theory of calculus. Newton had initially discovered the notion of calculus from

1664-1666 and had not released his finding until 1693. A German mathematician by the name of Gottfried Wilhelm von Leibniz had independently discovered the same concepts as Newton in 1672-1676 and published his findings in 1684. This lead to a large controversy, mainly due to who would get the credit of discovery. This fierce debate was eventually settled where Newton was given full credit for his findings based on the time frame of his work.

**Works Cited**


1. https://www.britannica.com/biography/Isaac-Newton
2. http://www.storyofmathematics.com/17th_newton.html