Fundamental Theorem of Calculus 1 and 2

Alan and Sam

The fundamental theorems of Calculus are processes that aid in the solving of essential calculus problems, and make our lives as mathematicians easier. The main application for both of these theorems is finding an area under a curve. Without these theorems this process is long and tedious, and doesn't usually equate to an exact answer. That is why these tools are useful in countless scenarios.

The first fundamental theorem of calculus is used to find area under a curve; it states that one of the antiderivatives, say F, of some function f may be obtained as the integral of f with a variable bound of integration. Basically, this means that is you take the integral of a function f bound on a certain interval, say 0 to 1. That is the same thing as taking the antiderivative of f from the higher bound minus the lower bound. This will give you the exact area under the curve in a simpler and easier way. This becomes more of a challenge when the antiderivative becomes more confusing to find, and therefore this theorem may have to be substituted for another method of solving.

The second fundamental theorem of calculus is used to find area under a curve when there is an x in the function and in the interval bound. It allows you to build off of the first FTC by obtaining an antiderivative of function that you don't know already. Basically, it states the function f(t) on the bound interval a to x, the x can replace the t creating an f(x) function. This helps so that functions such as square root 1 + t squared can be solved. This theorem using properties from the Mean Value Theorem to create a precise answer for the area under the curve.