The Derivative:

The **derivative** is the first real calculus concept we will study this year. It is the rate of change of the output of a function with respect to its input.

In other words, it is the change in f(x) compared to the change in x.

HMMMMMMMM..... sound familiar?

Feb 24-11:38 AM

I can explain how the difference quotient estimates slope of a function.

The Derivative:

Evaluating A Difference Quotient

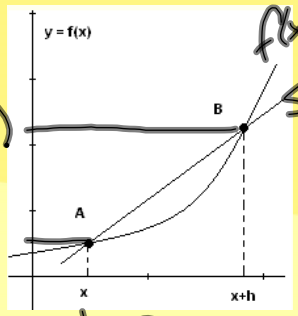
A common expression from calculus is the difference quotient. It is used when introducing a concept called the derivative. This presentation will show examples of how to simplify a difference quotient. The expression for the difference quotient is commonly given by:

$$\frac{f(x+h)-f(x)}{h}$$

Feb 24-11:38 AM

I can explain how the difference quotient estimates slope of a function.

The Derivative:



f(x+h)

f(x)

secant line

$$m = \frac{f(x+h) - f(x)}{x+h-x}$$

h

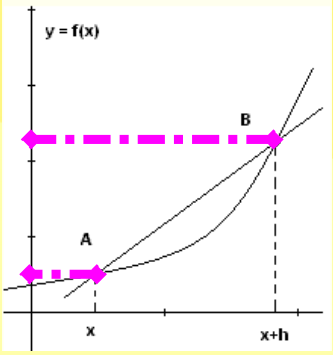
$$m = \frac{f(x+h)-f(x)}{h}$$

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$$

Feb 24-11:38 AM

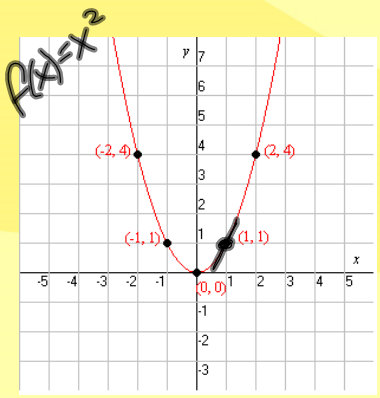
I can explain how the difference quotient estimates slope of a function.

The Derivative:



Feb 24-11:38 AM

I can calculate the derivative (slope) of a function using the limit definition.



$$\frac{dy}{dx} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{(x+h)^2 - x^2}{h}$$

$$= \lim_{h\to 0} \frac{x^2+2xh+h^2-x^2}{h}$$

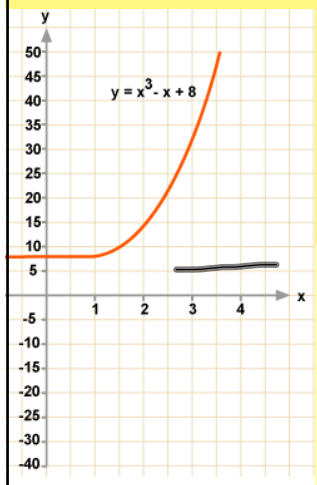
$$= \lim_{h\to 0} \frac{h^2+2xh}{h}$$

$$= \lim_{h\to 0} h+2x$$

$$= 2x$$

Feb 24-11:37 AM

I can calculate the derivative (slope) of a function using the limit definition.



$$\frac{dy}{dx} = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{(x+h)^3-(x+h)+8-(x^3-x+8)}{h}$$

$$= \lim_{h\to 0} \frac{x^3+3x^2h+3xh^2+h^3-x-h+8-x^3+x-8}{h}$$

$$= \lim_{h\to 0} 3x^2+3xh+h^2-1$$

$$= 3x^2-1$$

Feb 24-12:26 PM