Formal Definition of Derivative

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

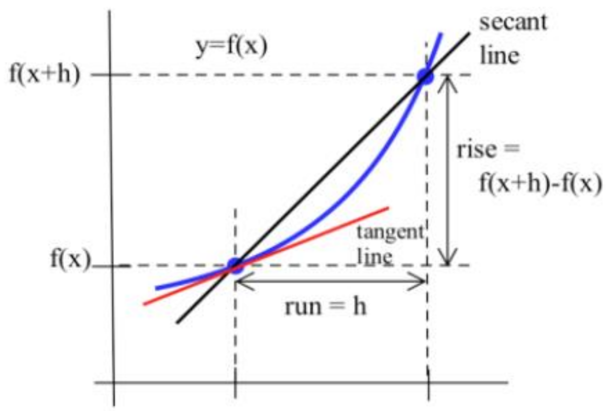
Average Rate of Change

is the sloe of the secant line

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

Instantaneous Rate of Change

is the slope of the tangent line



Formal Definition of Derivative

Definition of the Derivative:
The derivative of a function f is a new function, f' (pronounced "eff prime"), whose value at x is:

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

if this limit exists and is finite.

Formal Definition of Derivative

Definition of Derivative

The derivative of a function *f* at a point x, written $f\,'(x)$, is given by:

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

if this limit exists.

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The derivative of a function f is a new function, f' (pronounced "eff prime"), whose value at x is:

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if this limit exists and is finite.

Formal Definition of Derivative

Derivative at a point

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

Formal Definition of Derivative

The *average rate of change* of $f(x)$ with respect to x as x changes from a to b is

$$\frac{f(b) - f(a)}{b - a}.$$

The *instantaneous rate of change* of $f(x)$ at $x = a$ is

$$\lim_{h \to 0} \frac{f(a+h) - f(a)}{h} = \lim_{b \to a} \frac{f(b) - f(a)}{b - a},$$