

Formulas

Position/Velocity Function: $v(t) = s'(t)$

Product Rule: $f(x) = u(x)v(x)$

$$f'(x) = u'(x)v(x) + v'(x)u(x)$$

Quotient Rule: $f(x) = \frac{u(x)}{v(x)}$

$$f'(x) = \frac{u'(x)v(x) - v'(x)u(x)}{v^2(x)}$$

Power Rule: $f(x) = x^n$ where n is a #

$$f'(x) = nx^{n-1}$$

Tangent Line: 1) Find y'

2) Plug $x=c$ for y , and y' .

3) Plug values from (2) into

$$y - y(c) = y'(c)(x - c)$$

4) Solve for y .

Derivatives of Trig Functions

$$\frac{d}{dx} [\sin x] = \cos x$$

$$\frac{d}{dx} [\cos x] = -\sin x$$

$$\frac{d}{dx} [\tan x] = \sec^2 x$$

$$\frac{d}{dx} [\cot x] = -\csc^2 x$$

$$\frac{d}{dx} [\sec x] = \sec x \tan x$$

$$\frac{d}{dx} [\csc x] = -\csc x \cot x$$

Derivative of e^x is e^x .

Continuity: $\lim_{x \rightarrow c^-} f(x) = \lim_{x \rightarrow c^+} f(x) = f(c) = \lim_{x \rightarrow c} f(x)$

Limit doesn't exist (DNE) when $\lim_{x \rightarrow c^-} f(x) \neq \lim_{x \rightarrow c^+} f(x)$

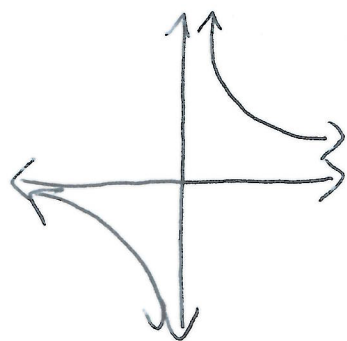
Ex: $f(x) = \frac{1}{x}$

$$\lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$$

$$\lim_{x \rightarrow 0^+} \frac{1}{x} = \infty$$

$$\lim_{x \rightarrow 0} \frac{1}{x} \text{ DNE}$$

$f(0)$ undefined



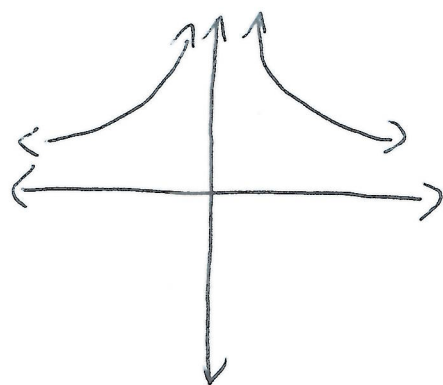
Ex: $f(x) = \frac{1}{x^2}$

$$\lim_{x \rightarrow 0^-} \frac{1}{x^2} = \infty$$

$$\lim_{x \rightarrow 0^+} \frac{1}{x^2} = \infty$$

$$\lim_{x \rightarrow 0} \frac{1}{x^2} = \infty$$

$f(0)$ undefined



Rate of change is the derivative

~~Def~~ Limit Def of Derivative

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

Horizontal Tangent
means the derivative
is zero.

$$f'(x) = 0$$