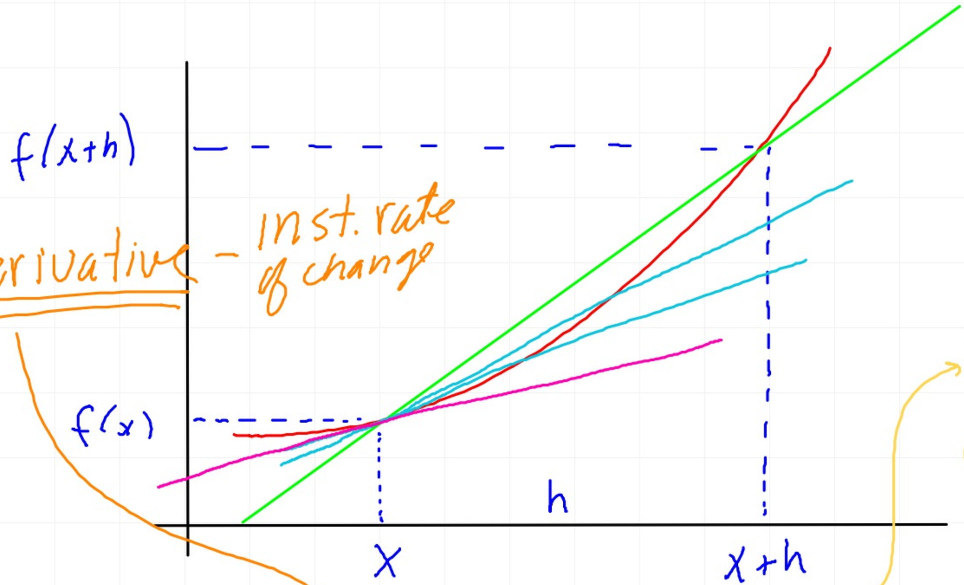
Definition of Derivative



derivative – inst. rate of change

difference quotient (avg rate of change)

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

$f(x) = x^2 + 2x - 1$ find $f'(x)$.

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

$$= \lim_{h \to 0} \frac{(x+h)^2 + 2(x+h) - 1 - (x^2 + 2x - 1)}{h}$$

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

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

$$= 2x + 2$$

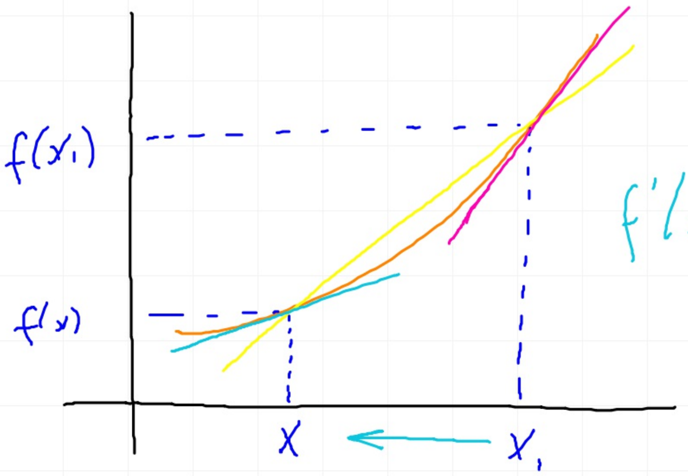
$$\therefore f'(x) = 2x + 2$$

Eq of tan at $x=3$

$f(3) = 14 \rightarrow (3, 14)$

$f'(3) = 8 \rightarrow m_T = 8$

$\therefore y - 14 = 8(x - 3)$



$$f'(x) = \lim_{x_1 \to x} \frac{f(x_1) - f(x)}{x_1 - x}$$

$f(x) = \quad f'(x)$

$y = \quad \frac{dy}{dx}$

$y = x^2 + 2x - 1$

$\frac{dy}{dx} = 2x + 2$

$\left.\frac{dy}{dx}\right|_{x=3} = 8$

$$\frac{d}{dx}\left[x^2+2x-1\right] = 2x+2$$

$$D_x\left[x^2+2x-1\right] = 2x+2$$

Given $s(t) = t^2 - 8t + 9$ find vel. at $t=2$.

$$s'(t) = \lim_{h \to 0} \frac{s(t+h) - s(t)}{h}$$

$v(t)$

$$= \lim_{h \to 0} \frac{(t+h)^2 - 8(t+h) + 9 - (t^2 - 8t + 9)}{h}$$

$=$

$=$

$v(t) = 2t - 8$

$v(2) = -4$

$$f(x) = x^2 + 2x - 1$$

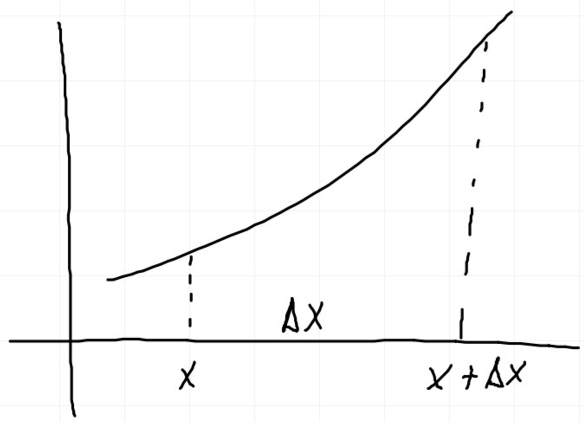
$$\frac{f(x+h) - f(x)}{h} = \frac{x^2 + 2xh + h^2 + 2x + 2x - 1 - x^2 - 2x + 1}{h}$$

$$= \frac{2xh + h^2 + 2h}{h}$$

$$= 2x + h + 2$$

"supressing the h"

$$= 2x + 2$$



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