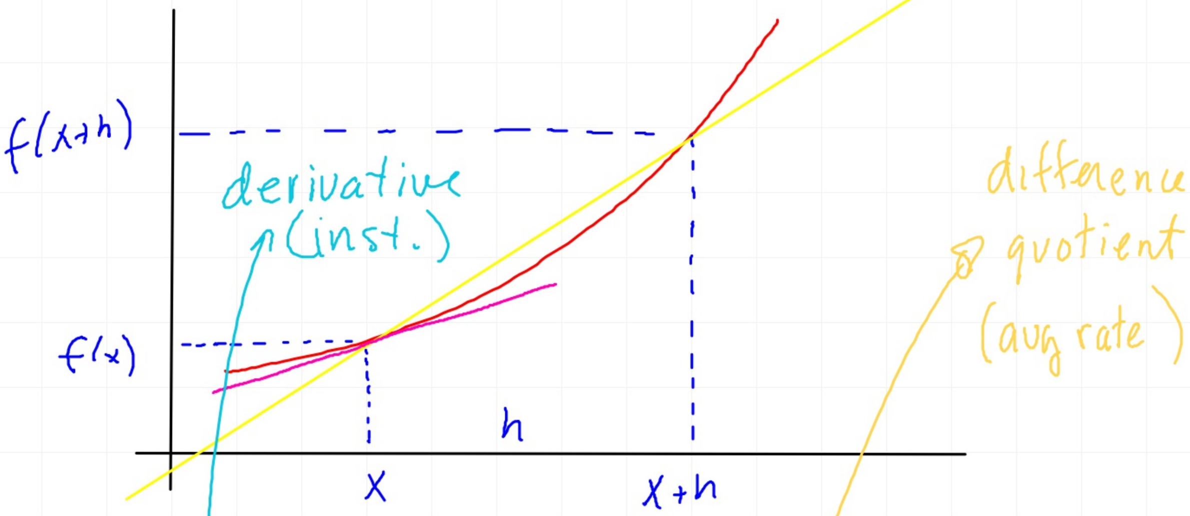
Definition of Derivative



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

Crazy old folks...

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

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

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

~~"suppressing the h"~~

$$= 2x + 2$$

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

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

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

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

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

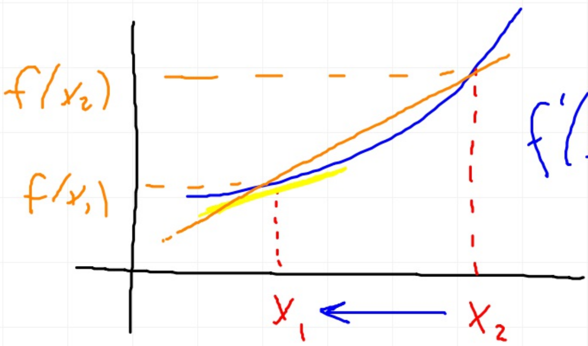
Write eq of tan to f at $x = 3$

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

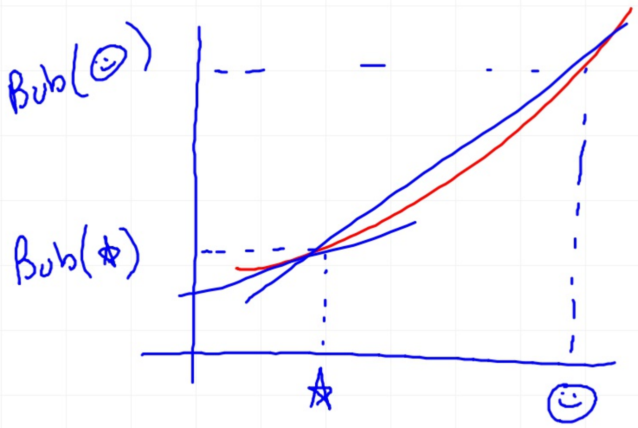
$f'(3) = 8 \rightarrow m_T = 8$

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

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



$$f'(x_1) = \lim_{x_2 \to x_1} \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$



$$\mathrm{Bob}'(\star) = \lim_{\text{☺} \to \star} \frac{\mathrm{Bob}(\text{☺}) - \mathrm{Bob}(\star)}{\text{☺} - \star}$$

Notations

$f(x) =$ $\qquad f'(x) =$ $\qquad f'(3) =$

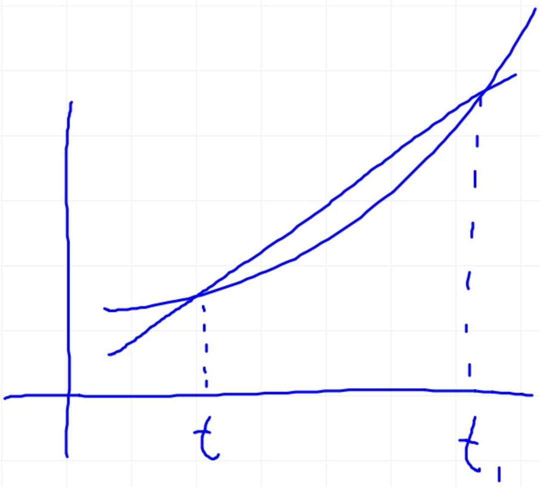
$y =$ $\qquad \frac{dy}{dx} =$ $\qquad \left.\frac{dy}{dx}\right|_{x=3} =$

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

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

$s(t) =$ position $\qquad s'(t) = v(t)$

$x(t) =$ " $\qquad x'(t) = v(t)$



$$\frac{s(t_1) - s(t)}{t_1 - t}$$

$s(t) = t^2 + 2t - 1$ find vel at $t = 2$.

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

$=$

$=$

$s'(t) = 2t + 2$

$s'(2) = 6$