'a' they mean plug in a constant

$$\lim_{h\to 0}\frac{f(a+h)-f(a)}{h} = \text{Derivative @ } x=a \text{, i.e., } f'(a)$$

$$\sqrt{1-\frac{v^2}{c^2}} \approx \sqrt{1}$$

$f(x) = 3x-1$

$$f'(7) = \lim_{h\to 0}\frac{f(7+h)-f(7)}{h} = \frac{3(7+h)-1-(3(7)-1)}{h}$$

$$= \frac{21+3h-1-21+1}{h} = \frac{3h}{h} = 3$$ agrees with slope!

I hate this for specific a-values.

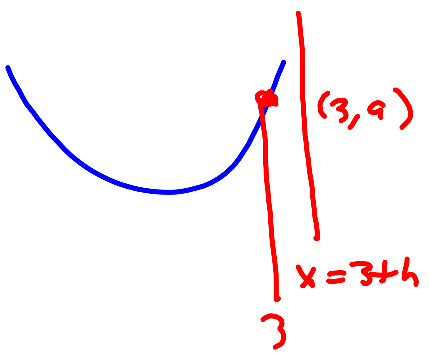
$$\lim_{h\to 0}\frac{(3+h)^2-9}{h} = \text{Slope of } x^2 \text{ @ } x=\boxed{3=a}$$

$= f'(3)$ for $f(x)=x^2$

On §2.1 Solutions, I re-did #5 many times

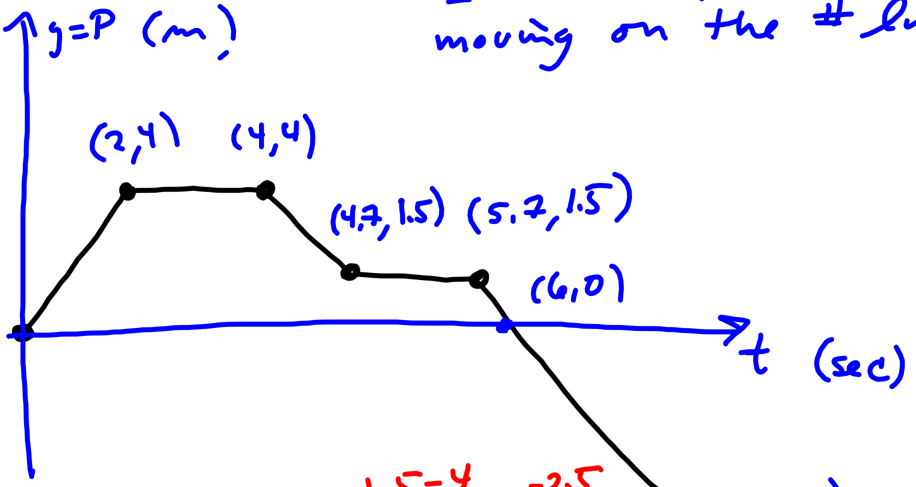
$f'(3)$ = Derivative / instantaneous slope @ $x=3$

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



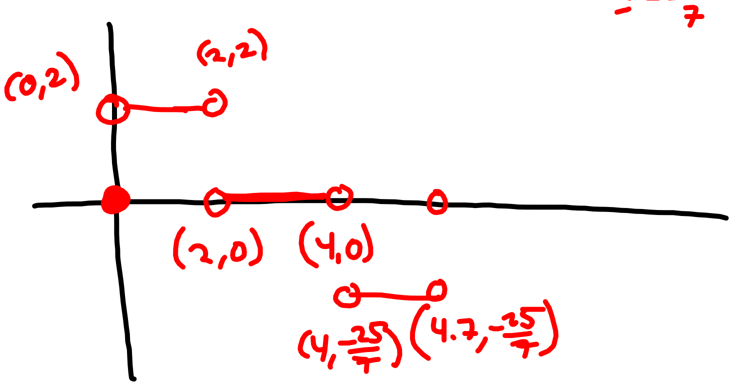
Position Func.

I have a particle moving on the # line



$$\frac{1.5-4}{4.7-4} = \frac{-2.5}{.7} = -\frac{25}{7}$$

Velocity Func.



Find eq'n of tangent line to $f(x) = x^2 - 5x$

$\underline{f(x+h)} \neq f(x)+h$

@ $x = 1$.

$$\frac{f(1+h) - f(1)}{h} = \frac{(1+h)^2 - 5(1+h) - (1^2 - 5(1))}{h}$$

$$= \frac{1 + 2h + h^2 - 5 - 5h - (-4)}{h} = \frac{1 + 2h + h^2 - 5 - 5h + 4}{h}$$

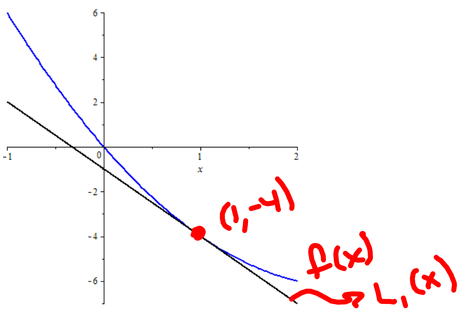
$$= \frac{2h + h^2 - 5h}{h} = \frac{-3h + h^2}{h} = \underset{(h \neq 0)}{-3 + h} \xrightarrow{h \to 0} -3 = f'(1)$$

Need $f(1) = -4 \rightsquigarrow (x_1, y_1) = (1, -4)$

$m_{tan} = -3$

$y = m(x - x_1) + y_1$

$$\boxed{y = -3(x-1) - 4}$$



$L_1(x)$ = Linearization of $f(x)$ @ $x = 1$

Zoom in! It's Locally Linear!

$f(x) \approx L_1(x)$ when $x \approx 1$.