February 24

What is the definition of the derivative?

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

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Students will verbally explain how to find the slope of the tangent line

(using the words: limit, secant, tangent...)

# Definition of the Derivative

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

$y = x^2 - 7x + 20$

Find $\frac{dy}{dx}$

$(y', f'(x))$

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

$$f(x)=x^2-7x+20$$

$$f(x+h)=(x+h)^2-7(x+h)+20$$

$$f'(x)=\lim_{h\to 0}\frac{(x+h)^2-7(x+h)+20-(x^2-7x+20)}{h}$$

$$=\lim_{h\to 0}\frac{(x+h)(x+h)-7x-7h+20-x^2+7x-20}{h}$$

$$=\lim_{h\to 0}\frac{x^2+2xh+h^2-7x-7h+20-x^2+7x-20}{h}$$

$$=\lim_{h\to 0}\frac{2xh+h^2-7h}{h}=\lim_{h\to 0}\frac{h(2x+h-7)}{h}$$

$$=\lim_{h\to 0}2x+h-7=2x-7$$

$$f'(x)=2x-7$$

Find y' at x = 2

$y'=2x-7$

$y'(2)=2(2)-7=-3$

↑ slope of tangent line at $x=2$

Write an equation of the tangent line at x = 2

slope $=-3$

$x=2$

$y=2^2-7(2)+20=10$

$y-10=-3(x-2)$

$f(x) = x^2 + 9x$

Find $f'(x)$

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

$f(x) = x^2 + 9x$

$f(x+h) = (x+h)^2 + 9(x+h)$

$$f'(x) = \lim_{h \to 0} \frac{(x+h)^2 + 9(x+h) - (x^2 + 9x)}{h} = 2x + 9$$

Pg 125 #3, 5 (only use EQ 1),
19, 20, 27, 29, 31, 33, 35, 51 – 56 (all)