HW Review

Ex: $\lim_{x \to 0} \frac{7\sqrt{x}}{x}$

"$\frac{0}{0}$"

$$\lim_{x \to 0} \frac{7\sqrt{x}}{\sqrt{x} \cdot \sqrt{x}}$$

* cancel $\sqrt{x}$

$$= \lim_{x \to 0} \frac{7}{\sqrt{x}} = \boxed{\text{DNE}}$$

"$\frac{7}{0}$"

Chapter 4 - Day 1

the derivative of f with respect to x, $f'(x)$ is

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

the tangent line to the graph of f at a point $(x_0, f(x_0))$ is given by

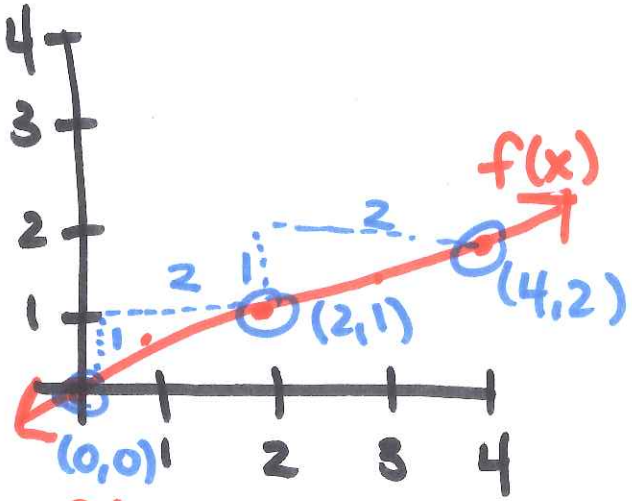
$$y = f(x_0) + f'(x_0)(x - x_0)$$

Ex: Consider the graphs and their tangent lines at a given point. Find $f'(2)$ by analyzing the graph.

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

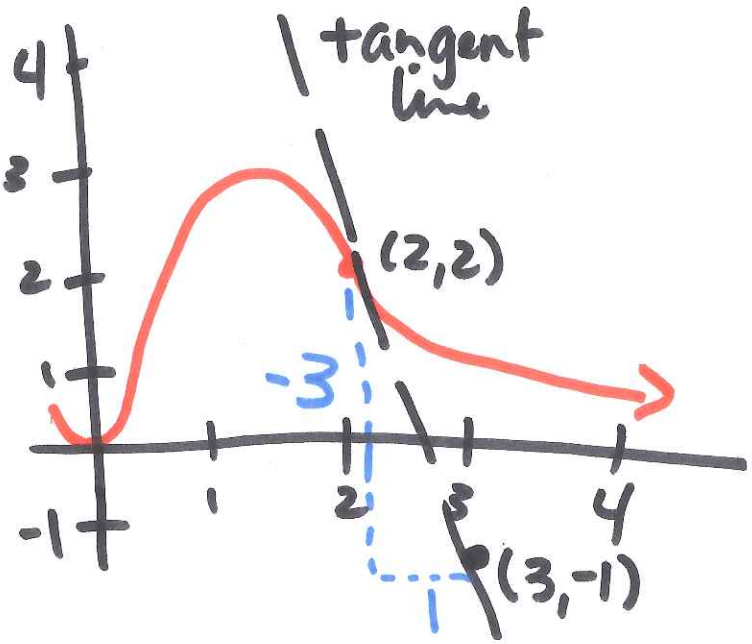
a line

(tangent line is itself)



$f'(2)$ = slope of tangent line at $x=2$

$f'(2) = \frac{1}{2}$



$f'(2) = -3$

Recall: for $f(x) = ax^2 + bx + c$,
we found $f'(x) = 2ax + b$

* Knowing the derivative comes in handy when we aren't given a graph.

Ex: let $f(x) = 3x^2 + 2$. find $f'(4)$

using our formula with $f(x) = 3x^2 + 0x + 2$

then $f'(x) = 2(3)x + 0 = 6x$

so $f'(4) = 6(4) = \boxed{24}$

Ex: Consider $g(x) = 4x^2 + 6x + 5$. Write the equation of the tangent line to the graph of g at $x = -1$

* we need a point and a slope

Point: $(-1, g(-1))$

$g(-1) = 4(-1)^2 + 6(-1) + 5 = 4 - 6 + 5 = 3$

$\underline{(-1, 3)}$

Slope: $g'(-1)$

$g'(x) = 2(4)x + 6 = 8x + 6$

$g'(-1) = 8(-1) + 6 = -8 + 6 = -2$ $\underline{m = -2}$

Point-slope form:

$y - 3 = -2(x - -1)$

$y - 3 = -2x - 2$

$\boxed{y = -2x + 1}$

Ex: Consider $g(x) = 5x^2 + 3x + 1$

a) Write an equation of a tangent line to the graph of g at $x = 2$

$g(2) = 5(2^2) + 3(2) + 1 = 27$

Point $(2, 27)$

$g'(x) = 2(5)x + 3 = 10x + 3$

$g'(2) = 10(2) + 3 = 23$

then $y - 27 = 23(x - 2)$

$\boxed{y = 23x - 19}$

b) for what value of y does the tangent line go through the Point $(-2, y)$?

Plug in -2 $\quad y = 23(-2) - 19 = \boxed{-65}$