Today's Plan:

Learning Target (standard): I will find the slope of a tangent line.

Students will: Complete practice problems over previous concepts at the boards, put up homework problems on the board and make neccessary corrections to their own work, take notes over new material and complete practice problems over new concepts.

Teacher will: Provide practice problems over previous concepts, check homework problems for accuarcy and provide students feedback, describe and provide examples of new concepts and assign students assessment problems over new concepts.

Assessment: Board work, homework check and homework assignment

Differentiation: Students will work at the board, go over and correct homework at their seats, actively engage in lecture over new concepts, practice new concepts with the aid of other students and the teacher and complete homework assignment.

Evaluate the limit.

$$\lim_{x\to 2}\frac{\sqrt{x-3}+4}{x-2}\cdot\frac{\sqrt{x-3}-4}{\sqrt{x-3}-4}$$

$$=\lim_{x\to 2}\frac{x-3-16}{(x-2)(\sqrt{x-3}-4)}$$

$$=\lim_{x\to 2}\frac{x-19}{(x-2)(\sqrt{x-3}-4)}$$

$$=\text{DNE}$$

Evaluate the limit.

$$\lim_{x\to -1}\frac{\frac{1}{x+1}-\frac{1}{x}}{x+1} = \lim_{x\to -1}\frac{\frac{x}{x(x+1)}+\frac{-x-1}{x(x+1)}}{x+1}$$

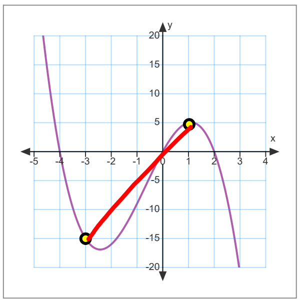
$$= \lim_{x\to -1}\frac{\frac{-1}{x(x+1)}}{x+1}$$

$$= \lim_{x\to -1}\frac{-1}{x(x+1)}\cdot\frac{1}{x+1}$$

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

$$= \text{DNE}$$

Slope of a Secant Line: *a line that intersects the function through two given points*



through $x=-3$

$x=1$

$$m = \frac{y_2-y_1}{x_2-x_1}$$

$$m_{sec} = \frac{f(x_2)-f(x_1)}{x_2-x_1}$$

AROC

"average rate of change"

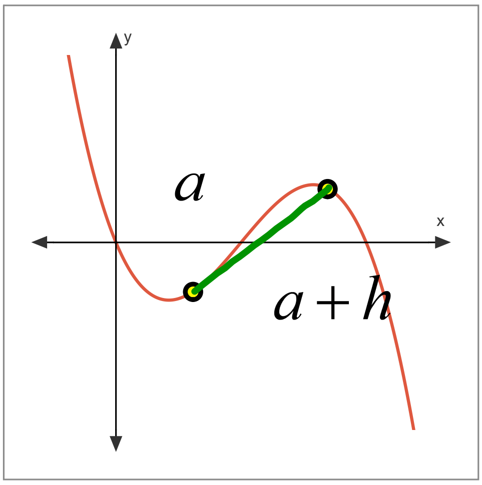
$$m_{sec} = \frac{f(1)-f(-3)}{1+3}$$

$$= \frac{5+15}{4} = \frac{20}{4}$$

$$m_{sec} = 5$$

Slope of a Secant Line:

"average rate of change"



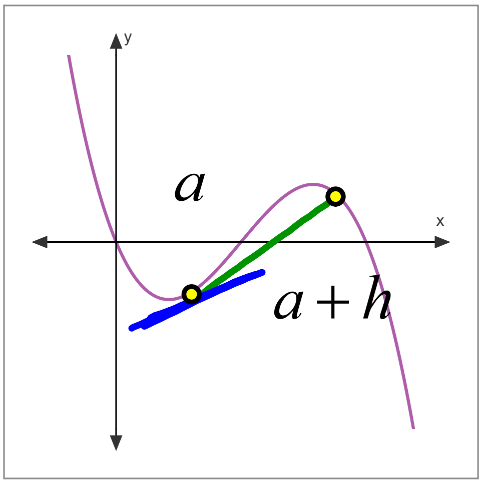
$$m_{sec} = \frac{f(a+h) - f(a)}{a+h-a}$$

$$m_{sec} = \frac{f(a+h) - f(a)}{h}$$

Slope of a Tangent Line:

a line that intersects the function at the given point - it may cross through the function at another point

"instantaneous rate of change"



$$m_{sec} = \frac{f(a+h) - f(a)}{a+h-a}$$

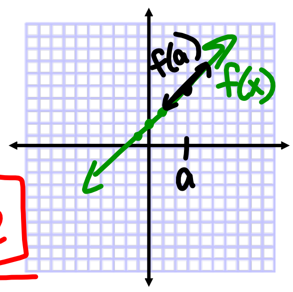
$$m_{sec} = \frac{f(a+h) - f(a)}{h}$$

$$m_{tan(a,f(a))} = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

If $f(x) = x + 2$, find the slope of the tangent line to $f(x)$ at the point $P(a, a+2)$.

$m = 1$

$I_y: (0,2)$



$$m_{\tan(a,f(a))} = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{h\to 0} \frac{[a+h+2] - [a+2]}{h}$$

$$= \lim_{h\to 0} \frac{a+h+2-a-2}{h}$$

$$= \lim_{h\to 0} \frac{h}{h}$$

$$= \lim_{h\to 0} 1$$

$$m_{\tan(a,f(a))} = 1$$

$f(x) = 3x^3 + 6x^2 + 2x + 1$

$m_{\tan(1,12)} =$

$$m_{\tan(a,f(a))} = \lim_{h\to 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{h\to 0} \frac{[3(a+h)^3 + 6(a+h)^2 + 2(a+h) + 1] - [3a^3 + 6a^2 + 2a + 1]}{h}$$

$$= \lim_{h\to 0} \frac{3(a^3 + 3a^2h + 3ah^2 + h^3) + 6(a^2 + 2ah + h^2) + 2a + 2h + 1 - 3a^3 - 6a^2 - 2a - 1}{h}$$

$$= \lim_{h\to 0} \frac{\cancel{3a^3} + 9a^2h + 9ah^2 + 3h^3 + \cancel{6a^2} + 12ah + 6h^2 + \cancel{2a} + 2h + \cancel{1} - \cancel{3a^3} - \cancel{6a^2} - \cancel{2a} - \cancel{1}}{h}$$

$$= \lim_{h\to 0} \frac{h(9a^2 + 9ah + 3h^2 + 12a + 6h + 2)}{h}$$

$$= \lim_{h\to 0} (9a^2 + 9ah + 3h^2 + 12a + 6h + 2)$$

$$= 9a^2 + 9a(0) + 3(0)^2 + 12a + 6(0) + 2$$

$$m_{\tan(a,f(a))} = 9a^2 + 12a + 2$$

$$m_{\tan(1,12)} = 9(1)^2 + 12(1) + 2$$

"a"

$$= 9 + 12 + 2$$

$$m_{\tan(1,12)} = 23$$

Assignment:

p.89 #1-4

* Graph the function and find the indicated slopes *