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.

p.89 #1-4

$$1)\, m_{\tan(a,f(a))} = -3a^2$$

$$2)\, m_{\tan(a,f(a))} = 3$$

$$3)\, m_{\tan(a,f(a))} = \frac{1}{2\sqrt{a}}$$

$$4)\, m_{\tan(a,f(a))} = -\frac{1}{a^2}$$

3) $f(x) = \sqrt{x} + 1$ $\quad m_{\tan(a, f(a))} = m_{\tan(a, \sqrt{a}+1)}$

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

$$= \lim_{h \to 0} \frac{\left[\sqrt{a+h} + 1\right] - \left[\sqrt{a} + 1\right]}{h}$$

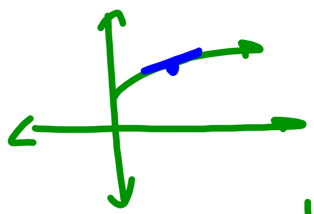
$$= \lim_{h \to 0} \frac{\sqrt{a+h} + 1 - \sqrt{a} - 1}{h}$$

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

$$= \lim_{h \to 0} \frac{a+h-a}{h\left(\sqrt{a+h} + \sqrt{a}\right)}$$

$$= \lim_{h \to 0} \frac{1}{\sqrt{a+h} + \sqrt{a}}$$

$$= \frac{1}{\sqrt{a+0} + \sqrt{a}}$$



$$m_{\tan(4,3)} = \frac{1}{2\sqrt{4}} = \frac{1}{4}$$

$$m_{\tan(a,f(a))} = \frac{1}{2\sqrt{a}}$$

$$4)\ f(x)=\frac{1}{x}-1$$

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

$$=\lim_{h\to 0}\frac{\left[\frac{1}{a+h}-1\right]-\left[\frac{1}{a}-1\right]}{h}$$

$$=\lim_{h\to 0}\frac{\frac{1}{a+h}-1-\frac{1}{a}+1}{h}$$

$$=\lim_{h\to 0}\frac{\frac{1}{a+h}-\frac{1}{a}}{h}$$

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

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

$$=\lim_{h\to 0}\frac{-\cancel{h}}{a(a+h)}\cdot\frac{1}{\cancel{h}}$$

$$=\lim_{h\to 0}\frac{-1}{a(a+h)}$$

$$=\frac{-1}{a(a+0)}$$

$$m_{\tan(a,f(a))}=-\frac{1}{a^2}$$

If $f(x) = x^2 + 1$, find the slope of the tangent line to $f(x)$ at the point $P(a, a^2 + 1)$.

$$m_{\tan(a,a^2+1)} = \lim_{h \to 0} \frac{\boxed{f(a+h)} - f(a)}{h}$$

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

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

$$= \lim_{h \to 0} \frac{2ah + h^2}{h}$$

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

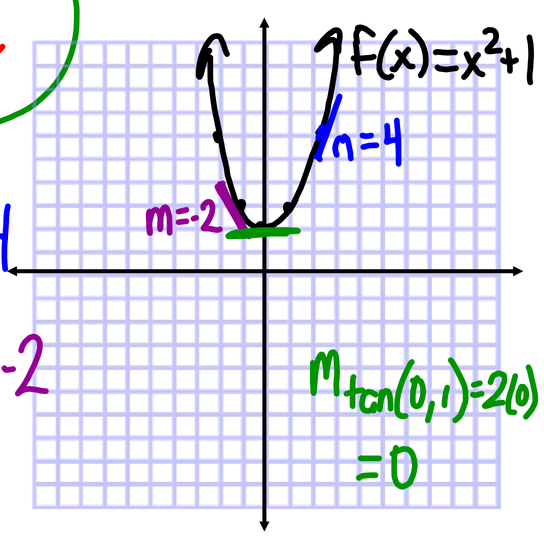
$$= 2a + 0$$

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

slope of a "general" tangent line

$$m_{\tan(2,5)} = 2(2) = 4$$

$$m_{\tan(-1,2)} = 2(-1) = -2$$



If $f(x)=2x-3$, find the slope of the tangent line to $f(x)$ at the point $P(a,2a-3)$.

$$m_{\tan(a,2a-3)}=\lim_{h\to0}\frac{f(a+h)-f(a)}{h}$$

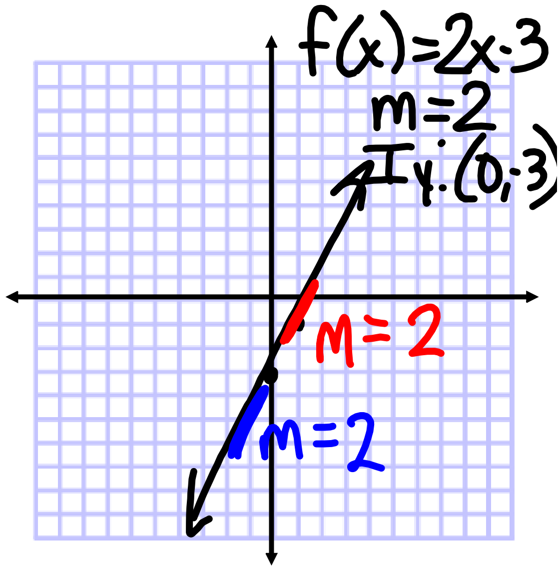
$$=\lim_{h\to0}\frac{[2(a+h)-3]-[2a-3]}{h}$$

$$=\lim_{h\to0}\frac{\cancel{2a}+2h\cancel{-3}\cancel{-2a}\cancel{+3}}{h}$$

$$=\lim_{h\to0}\frac{2h}{h}$$

$$=\lim_{h\to0}2$$

$$m_{\tan(a,2a-3)}=2$$



If $f(x)=x^3-2x$, find the slope of the tangent line to $f(x)$ at the point $P(a,a^3-2a)$. Graph the function and find the slope of the tangent line through (2,4) and through(1,-1). Explain the meaning of the result.

$$m_{\tan(a,a^3-2a)}=\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}$$

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

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

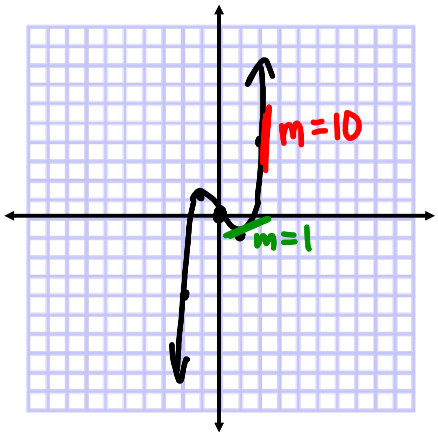
$$=\lim_{h\to 0}\frac{h(3a^2+3ah+h^2-2)}{h}$$

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

$$=3a^2+3a(0)+(0)^2-2$$

$$m_{\tan(a,a^3-2a)}=3a^2-2$$

$f(x)=x^3-2x$



$$m_{\tan(2,4)}=3(2)^2-2$$

$$m_{\tan(2,4)}=10$$

$$m_{\tan(1,-1)}=3(1)^2-2$$

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

$\therefore$ The slope of a tangent thru the point (a,a^3-2a) to the graph of $f(x)=x^3-2x$ is $3a^2-2$.

Assignment:

Tangent Line Worksheet

#1-8

* Find the indicated slopes & choose one to explain *