Today's Plan:

Learning Target (standard): I will review all properties of finding derivatives.

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.150 #8-14 even

* Use the 1st Derivative Test *

* Pick any two to write the explanations of the 1st Derivative Test *

We will be putting these problems up on the board and we will check them that way!

14) $f(x) = 8 - \sqrt[3]{x^2-2x+1}$ D: $\mathbb{R}$

$f(x) = 8 - (x^2-2x+1)^{\frac{1}{3}}$

$f'(x) = -\frac{1}{3}(x^2-2x+1)^{-\frac{2}{3}}(2x-2)$

$= -\frac{2}{3}(x-1)\left[(x-1)^2\right]^{-\frac{2}{3}}$

$= -\frac{2}{3}(x-1)(x-1)^{-\frac{4}{3}}$

$= -\frac{2}{3}(x-1)^{-\frac{1}{3}}$

$f'(x) = \frac{-2}{3\sqrt[3]{x-1}}$ D: $\{x \mid x \neq 1\}$

Critical #: $x = 1$

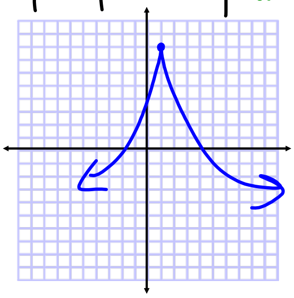
$f(1) = 8 - \sqrt[3]{1-2+1}$

$= 8 - \sqrt[3]{0}$

$f(1) = 8$

Domain Interval	-2	3	$\sqrt[3]{x-1}$	$f'(x)$	$f(x)$
$(-\infty, 1)$	−	+	−	+	increasing
$(1, \infty)$	−	+	+	−	decreasing

> cusp/max $= 8$ @ $x = 1$



Find the point on the given curve where the tangent is parallel to the *x*-axis.

$f(x) = 2x^3 - 3x^2 - 12x + 20$

$m_x = 0$

$m_{tan} = 0$

$f'(x) = 6x^2 - 6x - 12$

$0 = 6(x^2 - x - 2)$

$0 = 6(x-2)(x+1)$

$x = 2, -1$

$f(2) = 16 - 12 - 24 + 20$

$f(2) = 0$

$f(-1) = -2 - 3 + 12 + 20$

$f(-1) = 27$

$\boxed{(2, 0), (-1, 27)}$

Find the equation of the normal line to the curve through the given point.

$f(x) = \sqrt{x^2+5}$

$(-2,3)$

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

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

$f'(x) = \frac{x}{\sqrt{x^2+5}}$

$m_{tan}(-2,3) = \frac{-2}{\sqrt{4+5}}$

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

$m_{normal}(-2,3) = \frac{3}{2}$

$y = mx+b$

$3 = \frac{3}{2}(-2)+b$

$3 = -3+b$

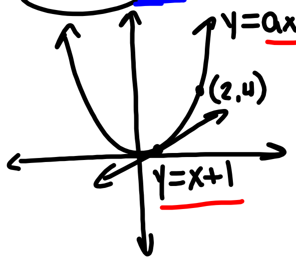
$b = 6$

$2\left[\boxed{y = \frac{3}{2}x+6}\right]$

$2y = 3x+12$

$\boxed{3x-2y = -12}$

The curve $y = ax^2 + bx + c$ passes through the point (2,4) and is tangent to the line $y = x+1$ at (0,1). Find a, b, and c.



$y = ax^2+bx+c = f(x)$

$f'(x) = 2ax+b$

$1 = 2a(0)+b$

$\boxed{b=1}$

$m_{tan}(0,1) = 1$

$f'(x) = 1$

$f'(0) = 1$

$y = ax^2+x+c$ @ (2,4)

$4 = a(2)^2+(2)+c$

$4 = 4a+2+c$

$y = ax^2+bx+c$ @ (0,1)

$1 = a(0)^2+b(0)+c$

$\boxed{c=1}$

$4 = 4a+2+1$

$4 = 4a+3$

$1 = 4a$

$\boxed{a = \frac{1}{4}}$

$\therefore\ y = \frac{1}{4}x^2+x+1$

Use the definition of derivative to find *f '(x)*. State 2 interpretations of the meaning of this derivative.

$$f(x)=\frac{4}{3x^2+2}$$

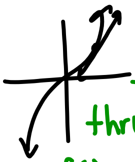
$$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$$

$$=\lim_{h\to 0}\frac{\frac{4}{3(x+h)^2+2}-\frac{4}{3x^2+2}}{h}=\lim_{h\to 0}\frac{\frac{4}{3x^2+6xh+3h^2+2}-\frac{4}{3x^2+2}}{h}$$

$$=\lim_{h\to 0}\frac{\frac{\cancel{12x^2}+\cancel{8}-\cancel{12x^2}-24xh-12h^2-\cancel{8}}{(3x^2+6xh+3h^2+2)(3x^2+2)}}{h}=\lim_{h\to 0}\frac{\frac{-24xh-12h^2}{(3x^2+6xh+3h^2+2)(3x^2+2)}}{h}$$

$$=\lim_{h\to 0}\frac{-24x-12h}{(3x^2+6xh+3h^2+2)(3x^2+2)}=\frac{-24x-12(0)}{(3x^2+6x(0)+3(0)^2+2)(3x^2+2)}$$

$$f'(x)=\frac{-24x}{(3x^2+2)^2}$$



∴ The slope of the tangent line thru $(x, f(x))$ to $f(x)=\frac{4}{3x^2+2}$ is $\frac{-24x}{(3x^2+2)^2}$.

The velocity of a particle moving along $f(x)=\frac{4}{3x^2+2}$ @ a time of "x" is $\frac{-24x}{(3x^2+2)^2}$.

Find the derivative:

$$f(x)=\left(x^6+1\right)^5\cdot(3x+2)^3$$

$$f'(x)=5(x^6+1)^4(6x^5)(3x+2)^3+3(3x+2)^2(3)(x^6+1)^5$$

$$=30x^5(x^6+1)^4(3x+2)^3+9(3x+2)^2(x^6+1)^5$$

$$=3(x^6+1)^4(3x+2)^2\left[10x^5(3x+2)+3(x^6+1)\right]$$

$$=3(x^6+1)^4(3x+2)^2(30x^6+20x^5+3x^6+3)$$

$$f'(x)=3(x^6+1)^4(3x+2)^2(33x^6+20x^5+3)$$

Find the derivative:

$$y = 7x^{-4} + 5x^{-\frac{1}{2}}$$

$$y' = -28x^{-5} - \frac{5}{2}x^{-\frac{3}{2}}$$

Find the derivative:

$$y = \cos^2(2x-1)$$

$$\boxed{\begin{aligned} y &= \cos f(x) \\ y' &= -f'(x)\sin f(x) \end{aligned}}$$

$$y = (\cos(2x-1))^2$$

$$y' = 2(\cos(2x-1)) \cdot -\sin(2x-1) \cdot 2$$

$$y' = -4\cos(2x-1)\sin(2x-1)$$

Find the derivative:

$$f(x)=\frac{x^5-3x^4}{x^2+7x} \qquad f(x)=\frac{x^4-3x^3}{x+7}$$

$$f'(x)=\frac{(4x^3-9x^2)(x+7)-1(x^4-3x^3)}{(x+7)^2}$$

$$=\frac{4x^4+28x^3-9x^3-63x^2-x^4+3x^3}{(x+7)^2}$$

$$=\frac{3x^4+22x^3-63x^2}{(x+7)^2}$$

$$f'(x)=\frac{x^2(3x^2+22x-63)}{(x+7)^2}$$

Find y':

$$x^2+2y=\ln(xy)-e^{4x}$$

$$y=\ln f(x) \qquad y'=\frac{f'(x)}{f(x)}$$

$$y=e^{f(x)} \qquad y'=f'(x)e^{f(x)}$$

$$x^2+2y=\ln x+\ln y-e^{4x}$$

$$2x+2y'=\frac{1}{x}+\frac{1}{y}y'-4e^{4x}$$

$$2y'-\frac{1}{y}y'=\frac{1}{x}-4e^{4x}-2x$$

$$y'\left(2-\frac{1}{y}\right)=\frac{1-4xe^{4x}-2x^2}{x}$$

$$y'\left(\frac{2y-1}{y}\right)=\frac{1-4xe^{4x}-2x^2}{x}$$

$$y'=\frac{y(1-4xe^{4x}-2x^2)}{x(2y-1)}$$

Find the derivative:

$$f(x) = \sec(2x-3)\cos(2x-3)$$

$y = \sec f(x)$
$y' = f'(x)\sec f(x)\tan f(x)$

$$f'(x) = 2\sec(2x-3)\tan(2x-3)\cos(2x-3) - 2\sin(2x-3)\sec(2x-3)$$

$$f'(x) = 2\sec(2x-3)\left[\tan(2x-3)\cos(2x-3) - \sin(2x-3)\right]$$

Find the derivative:

$$f(x) = \left(x^2 - \frac{1}{x^2}\right)^{-2}$$

$$f(x) = \left(\frac{x^4-1}{x^2}\right)^{-2}$$

$$f(x) = \left(\frac{x^2}{x^4-1}\right)^{2}$$

$$f'(x) = 2\left(\frac{x^2}{x^4-1}\right)\left[\frac{2x(x^4-1) - 4x^3(x^2)}{(x^4-1)^2}\right]$$

$$= 2\left(\frac{x^2}{x^4-1}\right)\left[\frac{2x^5 - 2x - 4x^6}{(x^4-1)^2}\right]$$

$$f'(x) = \frac{4x^3(x^4 - 1 - 2x^5)}{(x^4-1)^3}$$