find the equation of the tangent line given the x-value.

① $f(x) = x^2+8x+16$ when $x=-2$

$\frac{f(x)-f(c)}{x-c} \rightarrow \frac{\overbrace{x^2+8x+16}^{f(x)} - \overbrace{((-2)^2+8(-2)+16)}^{f(c)}}{x-c}$, $x=-2$

$\frac{x^2+8x+16-4\cancel{+16}\cancel{-16}}{x+2} \rightarrow \frac{\cancel{x^2+8x+12}}{\cancel{x+2}}$ $(x+6)(\cancel{x+2})$

general slope $\rightarrow x+6$

$f'(x) = x+6$

$f'(-2) = -2+6 = 4$ slope of the tangent line when $x=-2$

$y-y_1 = m(x-x_1)$

To find y

$f(-2) = x^2+8x+16$
$= (-2)^2+8(-2)+16$
$= 4-16+16$
$= 4$

$(-2,4)$

$y-4 = 4(x+2)$

Find the equation of the normal line $y-4 = -\frac{1}{4}(x+2)$

$f'(-2) = 4$ take neg recip

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Find the equation of the tangent line

$f(x) = \sqrt{3x-3}$ when $x=4$

$f'(x) \rightarrow \frac{\sqrt{3x-3} - \sqrt{3(4)-3}}{x-4}$

$\frac{\sqrt{3x-3} - \sqrt{9}}{x-4} \rightarrow \frac{\sqrt{3x-3}-3}{x-4} \cdot \frac{\sqrt{3x-3}+3}{\sqrt{3x-3}+3}$

$\frac{3x-3-9}{(x-4)(\sqrt{3x-3}+3)} \rightarrow \frac{3x-12}{(x-4)(\sqrt{3x-3}+3)}$

$\frac{3(\cancel{x-4})}{(\cancel{x-4})(\sqrt{3x-3}+3)} \rightarrow \frac{3}{\sqrt{3x-3}+3}$

$f'(4) = \frac{3}{\sqrt{3(4)-3}+3} \rightarrow \frac{3}{\sqrt{9}+3} \rightarrow 3/6 \rightarrow \frac{1}{2}$

To find y:

$\sqrt{3(4)-3} \rightarrow 3$

$(4,3)$ Eqn of the tangent line

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

Eqn of the normal line

$y-3 = -2(x-4)$

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HW

a) write eq of the tangent line
b) write eq of the normal line

1) $f(x) = 3x^2-4x+2$ when $x=2$
2) $f(x) = \sqrt{x^2+1}$ when $x=0$
3) $f(x) = \frac{1}{x^2}$ when $x=2$

$f(2) = \frac{1}{4}$ $(2,\frac{1}{4})$

$f'(x) \rightarrow \frac{\frac{1}{x^2}-\frac{1}{4}}{x-2} \rightarrow \frac{\frac{4}{4x^2}-\frac{x^2}{4x^2}}{x-2} \rightarrow \frac{\cancel{4-x^2}^{-1}}{4x^2} \cdot \frac{1}{\cancel{x-2}}$ $\cancel{(2-x)}(2+x)$

$\frac{-(2+x)}{4x^2} \rightarrow \frac{-(2+2)}{4(2)^2} \rightarrow -4/16 \rightarrow -1/4$

a) $y-\frac{1}{4} = -\frac{1}{4}(x-2)$

b) $y-\frac{1}{4} = 4(x-2)$

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