Derivatives at a Point

Name: ______________________ Date: ______________________

Question 1

Find the equation of the tangent line

I. $y = \frac{1}{x^3}$ $(-2, -1/8)$

Question 2

Find the slope of the function's graph at the point, and find the equation of the tangent line

I. $f(x) = \sqrt{x}$ $(4, 2)$

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Question 3

Find the slope of the curve at the point

I. $y = \frac{x - 1}{x + 1}$ $\quad x = 0$

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Question 1

Find the equation of the tangent line

I. $y = \frac{1}{x^3}$ $(-2, -1/8)$

$$\lim_{h \to 0} \frac{\frac{1}{(-2+h)^3} - \frac{1}{(-2)^3}}{h} \longrightarrow \frac{\frac{h(h^2-6h+12)}{8(-2+h)^3}}{h} \longrightarrow \frac{\cancel{h}(h^2-6h+12)}{8(-2+h)^3} \cdot \frac{1}{\cancel{h}}$$

$$\longrightarrow \frac{h^2-6h+12}{8(-2+h)^3} \longrightarrow \frac{(0)^2-6(0)+12}{8(-2+(0))^3} \longrightarrow \frac{-3}{16}$$

at point $(-2, -1/8)$

$$y - (-1/8) = (-3/16)(x - (-2)) \longrightarrow y = \frac{-3}{16}x - \frac{1}{2}$$ Tangent Line

Question 2

Find the slope of the function's graph at the point, and find the equation of the tangent line

I. $f(x) = \sqrt{x}$ $(4, 2)$

$$\lim_{h \to 0} \frac{\sqrt{4+h} - 2}{h} \longrightarrow \frac{\sqrt{4+h} - 2}{h} \cdot \frac{\sqrt{4+h} + 2}{\sqrt{4+h} + 2} \longrightarrow \frac{(4+h) - 4}{h\left(\sqrt{4+h} + 2\right)}$$

$$\longrightarrow \frac{\cancel{h}}{\cancel{h}\left(\sqrt{4+h} + 2\right)} \longrightarrow \frac{1}{\sqrt{4+h} + 2} \longrightarrow \frac{1}{\sqrt{4+(0)} + 2} \longrightarrow \frac{1}{4}$$

at point $(4, 2)$

$$y - (2) = (1/4)(x - (4)) \longrightarrow y = \frac{1}{4}x + 1$$ Tangent Line

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Question 3

Find the slope of the curve at the point

I. $y = \dfrac{x - 1}{x + 1}$ $\quad x = 0 \quad$ $\dfrac{(0) - 1}{(0) + 1} = -1$

$$\lim_{h \to 0} \frac{\dfrac{h - 1}{h + 1} - (-1)}{h} \longrightarrow \frac{\dfrac{2h}{h + 1}}{h} \longrightarrow \frac{2\cancel{h}}{h + 1} \cdot \frac{1}{\cancel{h}} \longrightarrow \frac{2}{h + 1} \longrightarrow \frac{2}{(0) + 1}$$

$$\downarrow$$

$$2$$