March 3

Find the derivative of each function below:

$f(x) = 4x^5$ $\Rightarrow$ $4(5x^4) = 20x^4$

$g(x) = 10x^{-3}$ $g'(x) = 10(-3x^{-4}) = -30x^{-4} = \frac{-30}{x^4}$

$h(x) = 12x^{1} + 10x^{0} - 3x^{-4}$

$12 + 0 - 3(-4x^{-5}) = 12 + 12x^{-5}$

$= 12 + \frac{12}{x^5}$

$12(1x^0)$ $10(0x^{-1})$

March 3

Students will verbally explain how to find derivative, using the power rule.

(using the words:
constant, exponent, sum...)

Find an equation of the line tangent to $f(x) = x^5 - 7x$ at $x = -1$

equation of a line

- slope → derivative
- point (x + y coordinate)

$f(x) = x^5 - 7x$

$f'(x) = 5x^4 - 7$

$f'(-1) = 5(-1)^4 - 7$

$= 5(1) - 7 = \boxed{-2}$

slope

$x = -1$

$f(-1) = (-1)^5 - 7(-1)$

$y = -1 + 7 = 6$

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

Find an equation of the line tangent to $f(x) = \sqrt{x} - x^2$ at $x = 4$

Slope → derivative

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

$f(x) = x^{1/2} - x^2$

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

$f'(4) = \frac{1}{2}(4)^{-1/2} - 2(4)$

$= \frac{1}{2}\left(\frac{1}{4^{1/2}}\right) - 8 = \frac{1}{2}\left(\frac{1}{\sqrt{4}}\right) - 8$

$= \frac{1}{2}\left(\frac{1}{2}\right) - 8 = \frac{1}{4} - 8 = \frac{1}{4} - \frac{32}{4} = \underline{\frac{-31}{4}}$

slope

$x = 4$

$f(4) = \sqrt{4} - 4^2$

$y = 2 - 16 = -14$

$$y + 14 = -\frac{31}{4}(x - 4)$$

Find an equation of the line tangent to $f(x) = \frac{1}{x^2} + x^3$ at $x = 2$

slope $\longrightarrow$ derivative

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

$f(x) = x^{-2} + x^3$

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

$f'(2) = 3(2)^2 + -2(2)^{-3}$

$= 3(4) + -\frac{2}{1}\left(\frac{1}{2^3}\right) = 12 - \frac{2}{1}\left(\frac{1}{8}\right)$

$= 12 - \frac{2}{8} = 12 - \frac{1}{4} = \frac{48}{4} - \frac{1}{4} = \boxed{\frac{47}{4}}$ slope

$x = 2$

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

$y = \frac{1}{4} + 8 = \frac{1}{4} + \frac{32}{4} = \frac{33}{4}$

$$y - \frac{33}{4} = \frac{47}{4}(x - 2)$$