

46 pts.

**Calculus II Quiz  
Derivative Review**

Name: \_\_\_\_\_

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- I. Use the definition of a derivative to find  $f'(x)$  for each of the following function. You must show all work and use correct notation.

$$4x-7$$

$$1. f(x) = 2x^2 - 7x$$

$$\begin{aligned} f'(x) &= \lim_{h \rightarrow 0} \frac{[2(x+h)^2 - 7(x+h)] - [2x^2 - 7x]}{h} \\ &= \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 7x - 7h - 2x^2 + 7x}{h} \\ &= \lim_{h \rightarrow 0} \frac{4xh + 2h^2 - 7h}{h} \\ &= \lim_{h \rightarrow 0} (4x + 2h - 7) \\ &= 4x - 7 \end{aligned}$$

- II. Find the derivative for each of the following functions.

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$$3. y = \frac{x^6}{5} - \frac{x^4}{3} + 8x + \frac{1}{x^3}$$

$$y' = \frac{6}{5}x^5 - \frac{4}{3}x^3 + 8 - 3x^{-4}$$

$$\frac{3}{2}(3x-5)^{\frac{1}{2}}$$

$$2. f(x) = \sqrt{3x-5}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{[\sqrt{3(x+h)-5}] - \sqrt{3x-5}}{h}$$

$$= \lim_{h \rightarrow 0} \frac{\sqrt{3x+3h-5} - \sqrt{3x-5}}{h} \cdot \frac{\sqrt{3x+3h-5} + \sqrt{3x-5}}{\sqrt{3x+3h-5} + \sqrt{3x-5}}$$

$$= \lim_{h \rightarrow 0} \frac{3x+3h-5 - 3x}{h(\sqrt{3x+3h-5} + \sqrt{3x-5})} = \lim_{h \rightarrow 0} \frac{3}{\sqrt{3x+3h-5} + \sqrt{3x-5}}$$

$$= \frac{3}{2\sqrt{3x-5}}$$

$$4. y = (x+5)(2x^2 - 1) = 2x^3 + 10x^2 - x - 5$$

$$y' = 6x^2 + 20x - 1$$

$$5. g(x) = \frac{5x^3 + 3x^2}{x^2} = 5x + 3$$

$$g'(x) = 5$$

$$6. y = (3x-1)^{-1}(x+4) = \frac{x+4}{3x-1}$$

$$y' = \frac{(3x-1) \cdot 1 - (x+4) \cdot 3}{(3x-1)^2}$$

$$= \frac{3x-1 - 3x-12}{(3x-1)^2} = \frac{-13}{(3x-1)^2}$$

7.  $y = \frac{x-5}{x}$

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

$$= \frac{x-x+5}{x^2} = \frac{5}{x^2}$$

8.  $y = \frac{x}{x-5}$

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

$$= \frac{x-5-x}{(x-5)^2}$$

$$= \frac{-5}{(x-5)^2}$$

9.  $y = 4x\sqrt{x} = 4x^{\frac{3}{2}}$

$$y' = 6x^{\frac{1}{2}}$$

10. Find the equation of the tangent to  $f(x) = \frac{1}{4}x^2 - 3$  at  $x = -2$ .

pt  $(-2, -2)$

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

$$f'(-2) = -1 = m$$

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

$$y + 2 = -x - 2$$

$$\boxed{y = -x - 4}$$

11. Find the equation(s) of all horizontal tangent(s) to the graph of  $y = x^3 - 3x - 4$ . Show all work.

$$y' = 3x^2 - 3$$

$$0 = 3x^2 - 3$$

$$3 = 3x^2$$

$$x = \pm 1$$

pts.  $(1, -6)$

$(-1, -2)$

$$\boxed{y = -6}$$

$$\boxed{y = -2}$$