

Math 251 Fall 2017

Quiz #4, October 3rd

Name: Solutions

There are 25 points possible on this quiz. This is a closed book quiz. Calculators and notes are not allowed. **Please show all of your work!** If you have any questions, please raise your hand.

Exercise 1. (5 pts.) Find the derivatives of the following functions.

(a)  $g(x) = \frac{3}{x^4} = 3x^{-4}$

$$g'(x) = -12x^{-5}$$

(b)  $f(x) = e^4$  ← That's a constant!

$$f'(x) = 0$$

(c)  $y = x^e$  (power rule!)

$$y' = ex^{e-1}$$

Exercise 2. (3 pts.) Differentiate the function  $H(u) = (3u - 1)(2u + 4)$ . Simplify your derivative.  
(product rule)

$$H'(u) = (3u - 1) \cdot 2 + 3 \cdot (2u + 4)$$

$$= 6u - 2 + 6u + 12$$

$$= 12u + 10$$

or: multiply first

$$H(u) = 6u^2 - 2u + 12u - 4 = 6u^2 + 10u - 4$$

$$H'(u) = 12u + 10$$

← Same answer either way.

Exercise 3. (4 pts.) Differentiate the function  $y = \frac{1 - 6x + x^2}{\sqrt{x}}$ . Simplify your derivative.

Simplify  $y$  first

$$y = x^{-\frac{1}{2}} - 6x^{\frac{1}{2}} + x^{\frac{3}{2}}$$

$$y' = -\frac{1}{2}x^{-\frac{3}{2}} - 3x^{-\frac{1}{2}} + \frac{3}{2}x^{\frac{1}{2}}$$

Exercise 4. (5 pts.) Where is the tangent line to  $y = e^x - 2x + 1$  parallel to  $4x - y = 1$ ?

The line  $4x - y = 1$  or  $y = 4x - 1$  has slope  $m = 4$ .

$$y' = e^x - 2.$$

We want to find  $x$  so that:  $e^x - 2 = 4$

$$e^x = 6$$

$$x = \ln 6$$

Exercise 5. (4 pts.) Find the derivative of  $G(x) = \frac{2x + 5}{x^2 + 1}$ . Simplify your derivative.

quotient rule

$$G' = \frac{(x^2 + 1)(2) - (2x + 5)(2x)}{(x^2 + 1)^2} = \frac{2x^2 + 2 - (4x^2 + 10x)}{(x^2 + 1)^2} = \frac{2x^2 + 2 - 4x^2 - 10x}{(x^2 + 1)^2}$$

$$= \frac{-2x^2 - 10x + 2}{(x^2 + 1)^2} = \frac{-2(x^2 + 5x - 1)}{(x^2 + 1)^2}$$

Exercise 6. (4 pts.) Find the derivative of  $f(x) = \overbrace{2x}^h \cdot \overbrace{e^x}^g$ . Simplify your derivative.

product rule

$$f'(x) = \overbrace{2x}^h \cdot \overbrace{e^x}' + \overbrace{2}' \cdot \overbrace{e^x}^g$$

$$= 2e^x(x + 1)$$