

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)  $f(x) = e^5$  ← this is a constant.

$$f'(x) = 0$$

(b)  $g(x) = \frac{5}{x^3} = 5x^{-3}$

$$g'(x) = -15x^{-4}$$

(c)  $y = x^e$

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

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

product rule:

$$\begin{aligned} H'(u) &= (3u-1) \cdot 1 + (3)(u+2) \\ &= 3u-1+3u+6 \\ &= 6u+5 \end{aligned}$$

or: multiply first

$$H(u) = 3u^2 - u + 6u - 2 = 3u^2 + 5u - 2$$

$$H'(u) = 6u + 5$$

Exercise 3. (4 pts.) Differentiate the function  $y = \frac{5 - 2x + x^2}{\sqrt{x}}$ . Simplify your derivative.

Simplify  $y$  first:

$$y = 5x^{-1/2} - 2x^{1/2} + x^{3/2}$$

$$y' = -\frac{5}{2}x^{-3/2} - x^{-1/2} + \frac{3}{2}x^{1/2}$$

Exercise 4. (3 pts.) Where is the tangent line to  $y = 4 + 2e^x - 4x$  parallel to  $4x - y = 1$ ?

• line:  $4x - y = 1$  or  $y = 4x + 1$ ; slope  $m = 4$

•  $y' = 2e^x - 4$

• We want  $2e^x - 4 = 4$

$$2e^x = 8$$

$$e^x = 4$$

$$x = \ln 4$$

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

quotient rule:

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

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

Exercise 6. (4 pts.) Find the derivative of  $f(x) = 3x^2e^x$ . Simplify your derivative.

product rule:

$$f'(x) = \underbrace{6x}_{h'} \cdot \underbrace{e^x}_{g'} + \underbrace{3x^2}_{h} \cdot \underbrace{e^x}_{g'}$$

$$= 3xe^x(2+x)$$