Math 251 Fall 2017   **Quiz #4, October 3rd**
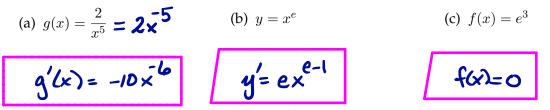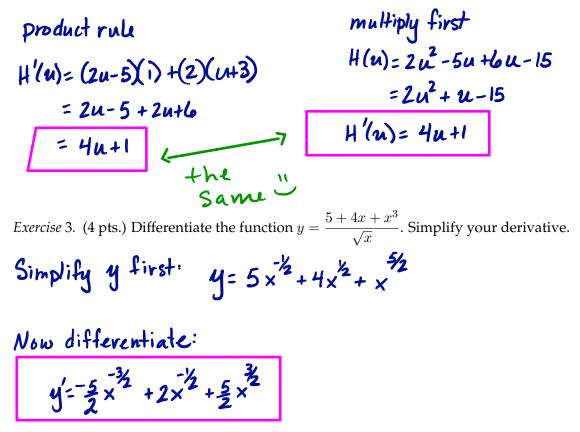
Name: _____ *Solutions* _____

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

(b) $y = x^e$

(c) $f(x) = e^3$

$$g'(x) = -10x^{-6}$$

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

$$f(x) = 0$$

Exercise 2. (3 pts.) Differentiate the function $H(u) = (2u-5)(u+3)$. Simplify your derivative.

product rule

$H'(u) = (2u-5)(1) + (2)(u+3)$

$= 2u - 5 + 2u + 6$

$= 4u + 1$

multiply first

$H(u) = 2u^2 - 5u + 6u - 15$

$= 2u^2 + u - 15$

$H'(u) = 4u + 1$

the
Same $\smile$

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

Simplify y first: $y = 5x^{-\frac{1}{2}} + 4x^{\frac{1}{2}} + x^{\frac{5}{2}}$

Now differentiate:

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

Exercise 4. (5 pts.) Where is the tangent line to $y = 2e^x - 8x + 1$ parallel to $4x - y = 1$?

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

• $y' = 2e^x - 8$

• We want $2e^x - 8 = 4$

$$2e^x = 12$$
$$e^x = 6$$
$$\boxed{x = \ln 6}$$

Exercise 5. (4 pts.) Find the derivative of $G(x) = \dfrac{3x^2 + 2}{2x - 1}$. Simplify your derivative.

$$G'(x) = \frac{(2x-1)(6x) - (3x^2+2)(2)}{(2x-1)^2} = \frac{12x^2 - 6x - (6x^2+4)}{(2x-1)^2}$$

$$= \frac{12x^2 - 6x - 6x^2 - 4}{(2x-1)^2} = \frac{6x^2 - 6x - 4}{(2x-1)^2} = \boxed{\frac{2(3x^2 - 3x - 2)}{(2x-1)^2}}$$

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

Product rule

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

$$\boxed{= 2x^2 e^x (x+3)}$$