

Name: _____

Solutions

Math 1300-005 - Spring 2017

Quiz 6 - 2/23/16

On my honor, as a University of Colorado at Boulder student, I have neither given nor received unauthorized assistance on this work.

Signature: _____

Guidelines: You are permitted to use notes, the book, in-class worksheets/solutions, and your classmates on this quiz. Computers and graphing technology of any kind, including calculators, are not allowed (exceptions made for those who have an e-book). Please show all work and clearly denote your answer.

1. Compute the following derivatives.

(a) $F(x) = (4^{x^2})(\tan(9x))$

$$F'(x) = 4^{x^2} \ln(4) 2x \cdot \tan(9x) + 4^{x^2} \cdot \sec^2(9x) \cdot 9$$

(b) $G(x) = \sqrt{\frac{e^x}{x^2 - 2x + 3}} = \left(\frac{e^x}{x^2 - 2x + 3}\right)^{\frac{1}{2}}$

$$G'(x) = \frac{1}{2} \left(\frac{e^x}{x^2 - 2x + 3}\right)^{-\frac{1}{2}} \cdot \frac{d}{dx} \left(\frac{e^x}{x^2 - 2x + 3}\right) \quad \text{QR}$$

$$= \frac{1}{2} \left(\frac{e^x}{x^2 - 2x + 3}\right)^{-\frac{1}{2}} \cdot \frac{e^x(x^2 - 2x + 3) - e^x(2x - 2)}{(x^2 - 2x + 3)^2}$$

(c) $H(x) = \sin(\cos(x^3 + 3))$

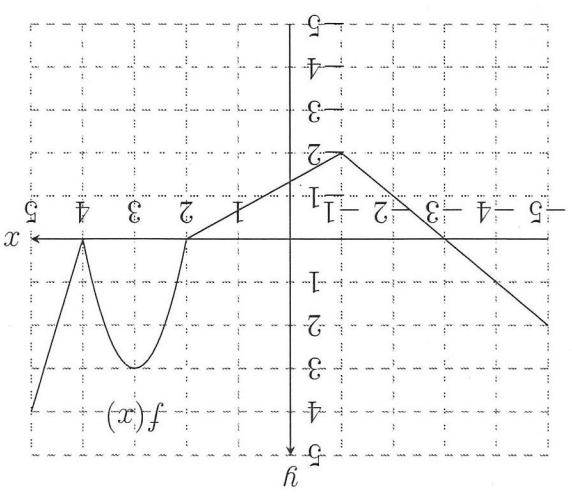
$$H'(x) = \cos(\cos(x^3 + 3)) \cdot \frac{d}{dx} \cos(x^3 + 3)$$

$$= \cos(\cos(x^3 + 3)) \cdot (-\sin(x^3 + 3)) \cdot \frac{d}{dx} (x^3 + 3)$$

$$= -\cos(\cos(x^3 + 3)) \cdot \sin(x^3 + 3) \cdot 3x^2$$

2. Consider the piecewise function f graphed below. Also consider the table of values for g and its derivative g' .

x	$g(x)$	$g'(x)$
1	3	-5
2	1	3
3	-2	-2



(a) If $J(x) = g(x)/f(x)$, find $J'(3)$.

$$J'(3) = \frac{g'(3)f(3) - g(3)f'(3)}{-2(3) - (-2)(0)} = \frac{[f(3)]g'}{-\frac{2}{3}} = \boxed{-\frac{3}{2}}$$

(b) If $L(x) = f(x)g(x)$, find $L'(1)$.

$$L'(1) = f'(1)g(1) + f(1)g'(1) = \frac{3}{2}(3) + (-\frac{1}{2})(-5) = 2 + \frac{5}{2} = \boxed{\frac{9}{2}}$$

(c) If $K(x) = f(g(x))$, find $K'(2)$.

$$K'(2) = f'(g(2)) \cdot g'(2) = f'(1) \cdot g'(2) = \frac{3}{2}(3) = \boxed{\frac{9}{2}}$$

(d) If $D(x) = g(f(x))$, find $D'(-4)$.

$$D'(-4) = g'(f(-4)) \cdot f'(-4) = g'(1)f'(-4) = (-5)(-1) = \boxed{5}$$

(e) (Half Point Bonus) If $R(x) = f(g(f(x)))$, find $R'(3)$.

$$R'(3) = f'(g(f(3))) \cdot g'(f(3)) \cdot f'(3) = f'(3) \cdot g'(3) \cdot f'(3) \cdot 0 = 0$$

I did not immediately say 0 b/c I need to make sure all derivatives involved exist!