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

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

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

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

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

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

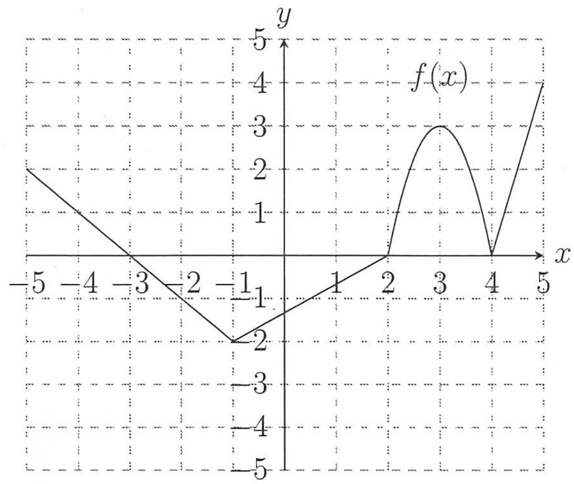
   $$H'(x) = \cos(\cos(x^3+3))\cdot\frac{d}{dx}\cos(x^3+3)$$

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

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

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 $J'(3)$.

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

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

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

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

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

(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 $R'(3)$.

$$R'(3) = f'(g(f(3))) \cdot g'(f(3)) \cdot f'(3) = f'(g(3)) \cdot g'(3) \cdot 0$$
$$= f'(-2) \cdot (-2) \cdot 0$$
$$= (-1)(-2)(0)$$
$$= \boxed{0}$$

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