Key

Review for "Derivatives..The Beginning" Exam

1. Using the table below, find the following derivatives:

x	f(x)	g(x)	f'(x)	g'(x)
-3	4	-6	-1	2
4	-1	-3	4	11

a. $\frac{d}{dx}[f(x)+g(x)]$ at x = -3

$f'(x)+g'(x) = f'(-3)+g'(-3) = -1+2 = 1$

b. $\frac{d}{dx}[f(x)\cdot 3g(x)]$ at x = -3

$f(x)(3g'(x))+3g(x)(f'(x)) = 4(3(2))+3(-6)(-1)$
$= 24+18 = 42$

c. $\frac{d}{dx}[f(g(x)]$ at x = 4

$f'(g(x))\cdot g'(x) = f'(-3)(11) = -1(11) = -11$

d. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]$ at x = 4

$\frac{g(x)\cdot f'(x)-f(x)\cdot g'(x)}{(g(x))^2} = \frac{-3(4)-(-1)(11)}{(-3)^2} = \frac{-1}{9}$

2. Given the following values of a continuous function, f(x) in the table below. Find the average rate of change of each given the specific interval:

x	-3	2	4	9
f(x)	7	-11	5	-1

a. [-3, 2]

$AROC = \frac{-11-7}{2+3} = \frac{-18}{5}$

b. [2, 9]

$AROC = \frac{-1-(-11)}{9-2} = \frac{12}{7}$

c. [-3, 9]

$AROC = \frac{-1-7}{9+3} = \frac{-8}{12}$

3. Write the equation of the tangent line to y = tan x – 3x + 8 at x = 0.

pt (0, 8)

m = -2

$y' = \sec^2 x - 3$

$y'(0) = 1-3 = -2$

$y-8 = -2(x-0)$

f. $y = \frac{3-x}{3x-1}$ $y' = \frac{(3x-1)(-1) - (3-x)(3)}{(3x-1)^2}$

g. $y = e^{\sqrt{3x}}$ $y' = e^{\sqrt{3x}} \left(\frac{1}{2}(3x)^{-\frac{1}{2}}(3)\right)$

h. $y = cos^4(5x)$ $y' = 4(\cos^3(5x))(-\sin(5x))(5)$

i. $y = -4x^2(\sin x)$ $y' = -4x^2(\cos x) + \sin x(-8x)$

j. $y = \tan(e^{x^2})$ $y' = \sec^2(e^{x^2})(e^{x^2})(2x)$

k. $y = \left(\frac{4x+9}{3x-1}\right)^3$ $y' = 3\left(\frac{4x+9}{3x-1}\right)^2 \left[\frac{(3x-1)(4) - (4x+9)(3)}{(3x-1)^2}\right]$

l. $y = \frac{4x^6}{3}$ $= \frac{4}{3}x^6$ $y' = 8x^5$

8. Find all points of the function $y = x(x^2 - 6x)$ where the slope = 0. $x^3 - 6x^2$

$y' = x(2x-6) + (x^2 - 6x) = 0$

$2x^2 - 6x + x^2 - 6x = 0$

$3x^2 - 12x = 0$

$x^2 - 4x = 0 \Rightarrow x(x-4) = 0$

$x = 0 \quad x = 4$

$(0, 0) \quad (4, 40)$

9. What is the instantaneous rate of change for the function $y = \frac{3x}{x^2+1}$ at $x = 1$?

A) -1

B) 0

C) 1

D) -2

E) None of these

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

$$y'(1) = \frac{2(3) - 3(2)}{4}$$