Math 171 - Quiz 5

September 30, 2010

Name key

Score

Show all work to receive full credit. Supply explanations when necessary.

1. (2 points) The following table gives information about the functions f and g.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	-7	0	4	2
1	-8	-1	7	5
2	-7	4	DNE	DNE
3	2	15	1	5

Use this information to find an equation of the line tangent to the graph of $y = f(x)g(x)$ at the point where $x = 1$.

$$\frac{dy}{dx} = f'(x)g(x) + f(x)g'(x)$$

$$\left.\frac{dy}{dx}\right|_{x=1} = (-1)(7) + (-8)(5) = -7 - 40 = -47$$

$$y\big|_{x=1} = f(1)g(1) = -56$$

$$y - y_0 = m(x - x_0)$$

$$y + 56 = -47(x-1)$$

$$\boxed{y = -47x - 9}$$

2. (3 points) An object is thrown straight up from over the side of a 110-ft building. If the object's initial velocity is 50 ft/sec, how high will it go and when will it land on the ground.

$$S(t) = -16t^2 + 50t + 110$$

$$S'(t) = -32t + 50$$

$$S'(t) = 0 \Rightarrow t = \frac{50}{32} = 1.5625$$

$$S(1.5625) = 149.0625$$

THE OBJECT WILL REACH A HEIGHT OF 149.0625 FT.

$$S(t) = 0$$

$$\Rightarrow t = \frac{-50 \pm \sqrt{50^2 + 4(16)110}}{-32}$$

$$\Rightarrow t = 4.6148$$

IT WILL LAND ON THE GROUND AFTER 4.6148 SEC

3. (1 point) Find $f''(x)$ if $f(x) = 8\sec x$.

$$f'(x) = 8 \sec x \tan x$$

$$f''(x) = 8 \sec x (\sec^2 x) + 8 (\sec x \tan x) \tan x$$

$$= \boxed{8 \sec^3 x + 8 \sec x \tan^2 x}$$

4. (3 points) Find each derivative.

(a) $\dfrac{d}{dx} \tan(3\pi x^2)$

$$= \sec^2 (3\pi x^2) (6\pi x)$$

$$= \boxed{6\pi x \sec^2 (3\pi x^2)}$$

(b) $\dfrac{d}{dr} \sin^2(2\pi r + 1)$

$$= 2 \sin (2\pi r + 1) \frac{d}{dr} \sin (2\pi r + 1)$$

$$= \boxed{2 \sin (2\pi r + 1) \cos (2\pi r + 1) (2\pi)}$$

5. (1 point) Find the rate of change of $g(x) = \dfrac{\sqrt{x}+6}{x^2-5x}$ at the point $(4, -2)$.

$$g'(x) = \frac{(x^2-5x)\frac{1}{2}x^{-1/2} - (\sqrt{x}+6)(2x-5)}{(x^2-5x)^2}$$

$$g'(4) = \frac{(-4)(\frac{1}{4}) - (8)(3)}{16} = \boxed{\frac{-25}{16}}$$