

# Math 171 - Quiz 7

October 10, 2018

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  $x = 1$ .

Slope...

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

$$m = \left. \frac{dy}{dx} \right|_{x=1} = f'(1)g(1) + f(1)g'(1)$$

$$= (-1)(7) + (-8)(5)$$

$$= -47$$

POINT...

$$x = 1$$

$$y = f(1)g(1)$$

$$= (-8)(7)$$

$$= -56$$

$$(1, -56)$$

LINE...

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

or

$$y = -47x - 9$$

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.

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

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

$$s'(t) = 0$$

$$\Rightarrow t = \frac{50}{32} = 1.5625 \text{ sec}$$

MAX HEIGHT

$$= s(1.5625)$$

$$= 149.0625 \text{ FT}$$

On ground...

$$s(t) = 0$$

$\Rightarrow$

$$-16t^2 + 50t + 110 = 0$$

$$t = \frac{-50 \pm \sqrt{2500 + 4(16)(110)}}{-32}$$

$$\approx 4.615 \text{ sec}$$

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

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

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

$$f''(x) = 8 \sec^3 x + 8 \sec x \tan^2 x$$

4. (3 points) Find each derivative.

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

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

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

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

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

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

$$= 4\pi \sin(2\pi r + 1) \cos(2\pi r + 1)$$

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

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

$$g'(4) = \frac{(-4)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) - (8)(3)}{(-4)^2} = \frac{-1 - 24}{16} = \frac{-25}{16}$$