2.6 Related Rates HW

Section 1: Let x and y be differentiable functions of t. Find the values of $\frac{dy}{dt}$ and $\frac{dx}{dt}$.

Equation	Find	Given
1. $y = \sqrt{x}$	(a) $\frac{dy}{dt}$ when $x = 4$	$\frac{dx}{dt} = 3$
	(b) $\frac{dx}{dt}$ when $x = 25$	$\frac{dy}{dt} = 2$
2. $y = 3x^2 - 5x$	(a) $\frac{dy}{dt}$ when $x = 3$	$\frac{dx}{dt} = 2$
	(b) $\frac{dx}{dt}$ when $x = 2$	$\frac{dy}{dt} = 4$
3. $xy = 4$	(a) $\frac{dy}{dt}$ when $x = 8$	$\frac{dx}{dt} = 10$
	(b) $\frac{dx}{dt}$ when $x = 1$	$\frac{dy}{dt} = -6$
4. $x^2 + y^2 = 25$	(a) $\frac{dy}{dt}$ when $x = 3, y = 4$	$\frac{dx}{dt} = 8$
	(b) $\frac{dx}{dt}$ when $x = 4, y = 3$	$\frac{dy}{dt} = -2$

Section 2: A point is moving along the graph of the given function at the rate $\frac{dx}{dt}$. Find $\frac{dy}{dt}$ for the given values of x.

5. $y = 2x^2 + 1; \frac{dx}{dt} = 2$ centimeters per second

(a) $x = -1$ (b) $x = 0$ (c) $x = 1$

6. $y = \frac{1}{1 + x^2}; \frac{dx}{dt} = 6$ inches per second

(a) $x = -2$ (b) $x = 0$ (c) $x = 2$

7. $y = \tan x; \frac{dx}{dt} = 3$ feet per second

(a) $x = -\frac{\pi}{3}$ (b) $x = -\frac{\pi}{4}$ (c) $x = 0$

8. $y = \cos x; \frac{dx}{dt} = 4$ centimeters per second

(a) $x = \frac{\pi}{6}$ (b) $x = \frac{\pi}{4}$ (c) $x = \frac{\pi}{3}$

Section 3: First World Problems

9. The radius of a circle is increasing at a rate of 4 cm per minute. Fin the rate of change of the area when a) $r = 8$cm and b) $r = 32$cm.

10. The radius of a sphere is increasing at a rate of 3 inches per minute.
a). Find the rates of change when the radius is 9 inches and when its 36 inches.
b). Explain why the rate of change of the volume of the sphere is not constant even though $\frac{dr}{dt}$ is constant.

11. At a construction site, sand is falling off a conveyor belt and onto a conical pile at a rate of 10 cubic ft per minute. The diameter of the base of the cone is approximately three time the altitude. At what rate is the height of the pile changing when the pile is 15 feet high? Volume of a cone is given by $V = \frac{1}{3}\pi r^r h$