Name: ___________________________________

MAT 2270: Section 3.3 – Differentiation Rules WS

Find the derivative of the following functions:	
1. $g(x) = \frac{5}{2}\sqrt[3]{x^2} + \frac{5}{3x^2}$	2. $y = \frac{x^4 - 5x^3 + \sqrt{x}}{x^2}$
3. $f(x) = (2x^{-3} + 1)(x - 5)$	4. $y = \frac{x^5}{5x^3 - 2}$
5. Find an equation of the tangent line to the graph of $f(x) = 6x - 16\sqrt{x}, \quad at\ \ x = 4$.	
Find the points on the graph of $f(x)$ where the tangent line is horizontal.	
6. $f(x) = 12x - x^2$	7. $f(x) = 4x^{-2} + 8x - 1$

8. The length of a rectangle is given by $2t + 1$ and its height is $\sqrt{t}$, where t is time in seconds and the dimensions are in centimeters. Find the rate of change of the area with respect to time.

9. The distance an object falls (when released from rest, under the influence of Earth's gravity, and with no air resistance) is given by $d(t) = 16t^2$, where d is measured in feet and t is measured in seconds. A rock climber sits on a ledge of a vertical wall and carefully observes the time it takes for a small stone to fall from the ledge to the ground.

a. Compute $d'(t)$. What units are associated with the derivative and what does it measure?

b. If it takes 6 seconds for a stone to fall to the ground, how high is the ledge?

c. How fast is the stone moving when it strikes the ground (in mi/hr)?

10. A population of 500 bacteria is introduced into a culture and grows in number according to the equation

$$P(t) = 500\left(1 + \frac{4t}{50 + t^2}\right)$$

where t is measured in hours. Find the rate at which the population is growing when $t = 2$.