Tangents and Velocities WS Name_____

1. Suppose an object moves with position function $s = f(t)$.
   a. Write an expression for the average velocity of the object in the time interval from t=a to t=a+h.

   b. Write an expression for the instantaneous velocity at time t=a.

2. Find an equation of the line tangent to the curve at the given point.
   a. $y = 1 - 2x - 3x^2$ (-2,-7)

   b. $y = \frac{1}{x^2}$ $(-2, \frac{1}{4})$

3. If a ball is thrown in to the air with a velocity of 40ft/s, its height in feet after t seconds is given by $y = 40t - 16t^2$. Find the velocity when t=2.

4. If an arrow is shot upward on the moon with a velocity of 58m/s, its height in meters after t seconds is given by $H = 58t - 0.83t^2$.
   a. Find the velocity of the arrow when t=a.

   b. Find the velocity of the arrow after 1 second.

   c. When will the arrow hit the moon?

   d. With what velocity will it hit the moon?

5. The displacement in meters of a particle moving in a straight line is given by the equation of motion $s = 4t^3 + 6t + 2$, where t is measured in seconds. Find the velocity of the particle at times t=a, t=1, t=2 and t=3.

6. The displacement in meters of a particle moving in a straight line is given by $s = t^2 - 8t + 18$, where t is measured in seconds.
   a. Find the average velocities over the following time intervals:
      i. [3,4]

      ii. [4,5]

   b. Find the instantaneous velocity when t=4.

7. Dominic dropped a water balloon out of the science building window 6 meters above the ground. What is the velocity at .5 sec? With what velocity will it hit the ground?