**Calculus** **Name**_____

**HW 30: Unit 3.7 Rate of Change Day 1**

1. A rock is dropped from a height of 576 ft and falls toward earth in a curved line. In t sec the rock reaches a height of $s(t) = -16t^2 + 576$ ft.

   (a) How many seconds after release does the rock hit the ground?

   (b) What is the average velocity of the rock during the time it is falling?

   (c) What is the average velocity of the rock for the first 3 sec?

   (d) What is the instantaneous velocity of the rock when it hits the ground?

   (e) What is the acceleration at $t = 6$ sec?

2. During the first 40 sec of a rocket flight, the rocket is propelled straight up so that in t sec it reaches a height of $s = 5t^3$ ft.

   (a) How high does the rocket travel in 40 sec?

   (b) What is the average velocity of the rocket during the first 40 sec?

   (c) What is the average velocity of the rocket during the first 135 ft of its flight?

   (d) What is the instantaneous velocity of the rocket at the end of 40 sec?

   (e) What is the acceleration at $t = 15$ sec?

3. A particle moves on a line away from its initial position so that after $t$ $hr$ it is $s = 3t^2 + t$ $mi$ from its initial position.

   (a) Find the average velocity of the particle over the interval $[1,3]$.

   (b) Find the instantaneous velocity at $t = 1$.

4. Let $y = 2x^2 - 1$.

   (a) Find the average rate at which y changes with x over the interval $[1,4]$.

   (b) Find the instantaneous rate at which y changes with x at the point $x = 1$.