Problem Set #4 1D Kinematics
Due Thursday Sept. 26 (A/B)/Friday Sept. 27 (C/D)

Name:_____

I worked with:

Equations:

Position (constant velocity)	$s(t) = s_0 + v_0t$
Position:	$s(t) = s_0 + v_0t + ½ at^2$
Velocity:	$v(t) = v_0 + at$
Final Velocity (time):	$v_f = v_0 + at_f$
Final Velocity (position):	$v_f^2 = v_0^2 + 2as_f$
Force:	$F = ma$
Acceleration due to gravity:	$9.8\ m/s^2$
Universal Gravitation:	$F = \frac{GMm}{r^2}$
Gravitational Constant:	$G = 6.67 \times 10^{-11}$
Avogadro's Number:	6.022×10^{23}

1. If the average velocity is non-zero for some time interval, does this mean that the instantaneous velocity can never be zero in that interval? Explain.

2. A spaceship far from any source of gravity is moving with a velocity of 60.0 m/s in the positive x direction at t=0. Between t=0 and t = 15.0 s, the velocity decreases uniformly to zero.
   a. What would the velocity vs time graph of the spaceships motion look like for this time interval
   b. What was the acceleration during this 15.0 s interval?
   c. What does the sign (positive/negative) mean for your answer?

3. A driver drives north for 35.0 min at 85.0 km/hr and then stops for 15.0 min. He then continues north, travelling 130 km in 2.00 hours.
   a. What is his total displacement?
   b. What is his average velocity over the entire time interval?

4. A ball is dropped from a height of 20.0 meters. How long does it take to hit the ground? What is its final velocity?

5. A car moving with an initial velocity of 20 m/s accelerates uniformly at 2 m/s^2 until it reaches a velocity of 60 m/s. How far did the car drive to make that happen?

6. (Honors) Standing on the edge of the HTHNC roof 20 meters high, you throw a tennis ball up straight up with a speed of 5 m/s, and then throw one straight down at the ground with a speed of 5 m/s. Right before the two balls hit the ground, how do their velocities compare? Assume no air resistance.