

Problem Set #2 1D Kinematics

Due Upon Return

Name: \_\_\_\_\_

I worked with:

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 spaceship's 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. 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.
4. 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?
5. 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?

6. A car moving with an initial velocity of 20 m/s accelerates uniformly at  $2 \text{ m/s}^2$  until it reaches a velocity of 60 m/s. How far did the car drive to make that happen?
  
7. A bird starts flying at 3 m/s, but after 20 seconds, it is now flying at 6 m/s. How far did it travel in order to make that change?
  
8. A car accelerates from an unknown starting velocity at  $-1.0 \text{ m/s}^2$ . After 5 seconds and after travelling 400 meters, the car comes to a stop. What was the initial starting velocity?
  
9. A train is traveling down a straight track at 20.0 m/s when the engineer applies the brakes. This results in an acceleration of  $-1.00 \text{ m/s}^2$  as long as the train is in motion. How far does the train move during a 40.0s time interval, starting at the instant the brakes are applied?