Name_____

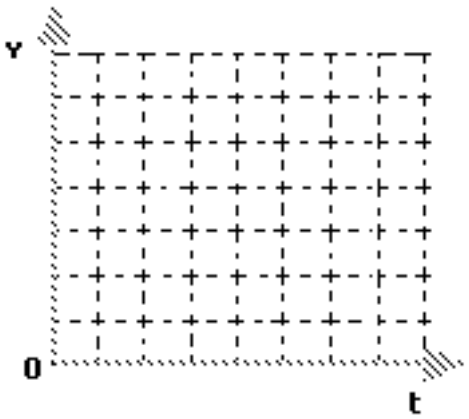
Date_____**Pd**____

UNIT III: Worksheet 3

While cruising along a dark stretch of highway at 30 m/s (≈65 mph), you see, at the fringes of your headlights, some roadkill on the highway. It takes you 0.5 s to react, then you apply the brakes and come to a stop 3.5s later. *Assume the clock starts the instant you see the hazard.*

1. Construct a motion map that represents the motion described above, including position, velocity, and acceleration. Hint: make the dots at 0.5s intervals.

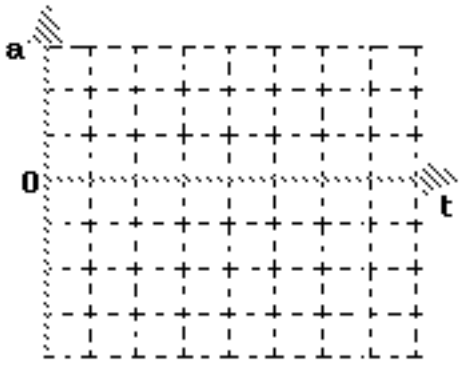
2. Construct a **quantitatively accurate v** vs **t** graph to describe the situation.



3. On the **v** vs **t** graph at right, graphically represent the car's displacement during this incident.

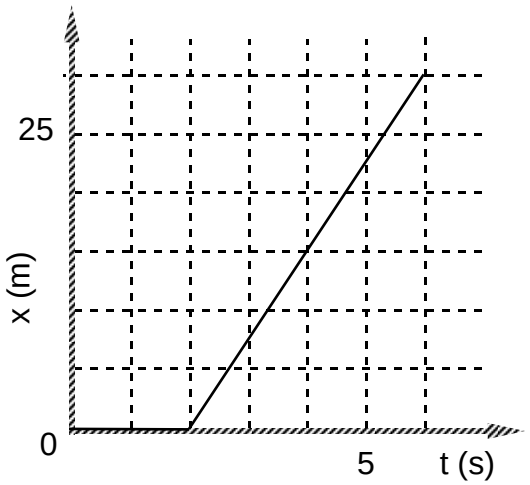
4. Utilizing the **graphical representation**, determine how far the car traveled during this incident. (Please explain your problem solving method.)

5. In order to draw the **a** vs **t** graph, you need to determine the car's acceleration once the brakes were applied.
   Please do this, then sketch a **quantitatively accurate a** vs **t** graph



6. Two kinds of motion occur in this case. For the first 0.5s, the car is traveling at constant velocity. For the remainder of the time, the car has an initial velocity and a uniform acceleration. Using the appropriate mathematical representation *for each phase of the motion,* determine how far the car traveled from the instant you noticed the hazard until you came to a stop. As always, show work and include units.

7. Compare your answers to 4 and 6.



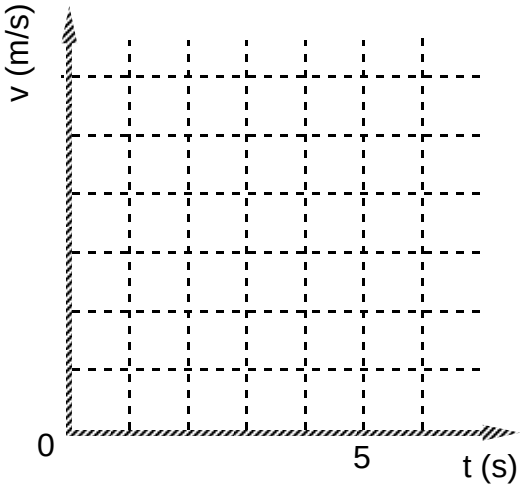
8. a. Describe in words the motion of the object from 0 - 6.0 s.

b. Construct a qualitative motion map to describe the motion of the object depicted in the graph above.

c. What is the instantaneous velocity of the object at the following times?
   i. t = 1.0 s
   ii. t = 3.0 s

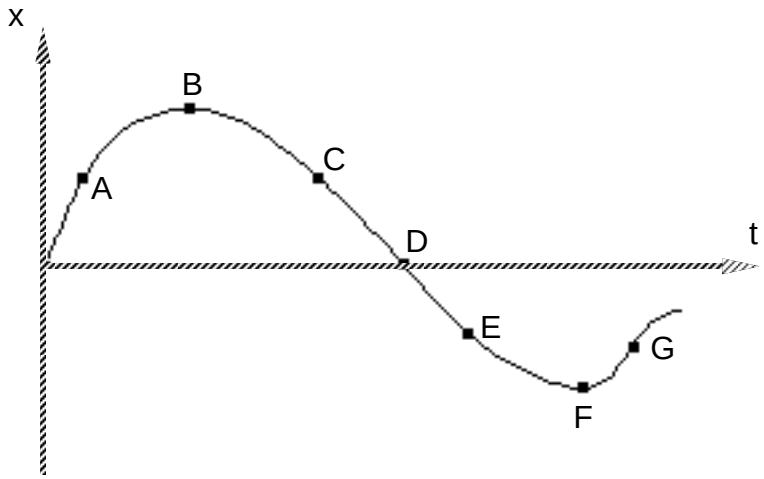
d. What is the simple average of these two velocities?
   What is the average velocity for the entire interval?
   Why are these two values different? Which is best to describe the motion of the object?

e. Graphically represent the relationship between velocity and time for the object described above.



f. From your velocity vs. time graph determine the total displacement of the object.

9. The graph below represents the motion of an object.



a. At what point(s) on the graph above is the object moving most slowly? (How do you know?)

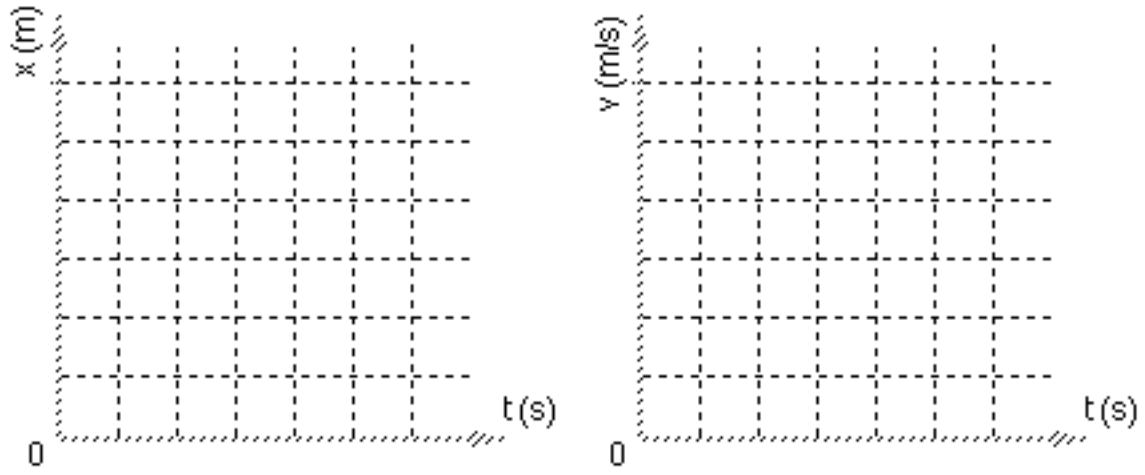
b. Over what intervals on the graph above is the object speeding up? (How do you know?)

c. Over what intervals on the graph above is the object slowing down? (How do you know?)

d. At what point(s) on the graph above is the object changing direction? (How do you know?)

10. A stunt car driver testing the use of air bags drives a car at a constant speed of 25 m/s for a total of 100. m. He applies his brakes and accelerates uniformly to a stop just as he reaches a wall 50. m away.

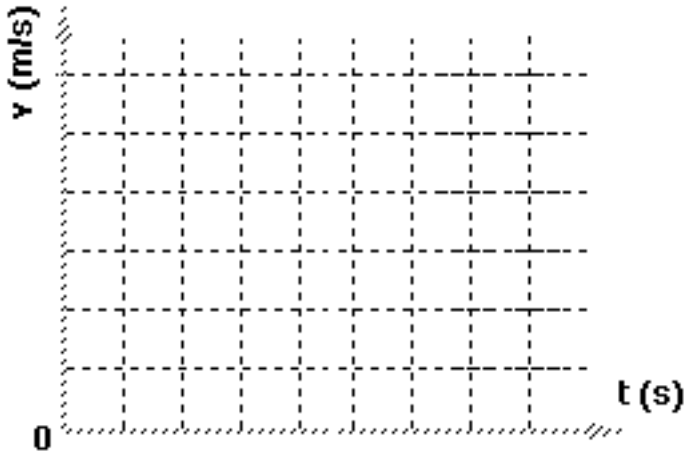
a. Sketch qualitative position vs. time and velocity vs time graphs.



b. How long does it take for the car to travel the first 100.m?

c. Remember that the area under a velocity vs time graph equals the displacement of the car. How long must the brakes be applied for the car to come to a stop in 50 m?

d. Now that you know the total time of travel, sketch a **quantitative** velocity vs time graph.



e. What acceleration is provided by the brakes? How do you know?