Linear Motion Homework Guide: Problem Solving

Coordinate System:
The first step in all problem solutions is to establish a coordinate system. Pick your coordinate system and draw it on a blank sheet of paper.

- Use an arrow to indicate the positive direction.
- Show x=0 (or y=0 if vertical).
- Show where the object is at t=0 and label it.

Strobe Photo:
Decide how many parts there are to the motion. Each part should be described (and labeled) as one of the following: 1) Constant Speed (different parts for different constant speeds), 2) Slowing Down, or 3) Speeding Up

Draw a picture of the object at the beginning and end of each part of the motion. (The end of Part I is the same picture as the beginning of Part II. Draw a picture of the car at the Middle Time in each part to show the type of motion for that part (constant, slowing, or speeding up).

Motion Vectors:
Include a velocity vector for each strobe photo. The vector will show the direction of the velocity and its length will be longer for faster velocities. You may use a dot for a zero length vector.

Include one acceleration vector for each part.

Kinematic (Motion) Variables:
Include values (and signs) for all known motion variables for each part. For example for a one part drawing you will need the variables shown at the right:

\[
\begin{align*}
x_1 &= x_2 = \\
v_1 &= v_2 = \\
t_1 &= t_2 = \\
a &=
\end{align*}
\]

Write the three equations (for each part) and mark all known values:

- Displacement \( \Delta x = \)
- Velocity \( v_{\text{avg}} = \)
- Acceleration \( a_{\text{avg}} = \)

Solve the equations. Begin with any equation that is solvable:

Check your work:
- Do all of your vector directions and your coordinate system agree with your signs?
- Did you use average values where the equations have them? (Not initial or final!)