HW Set 4 Equations of Motion

Problem 1

An object moves along the x axis with an acceleration of +3 m/s^2. Its position at t = 0 s is –10 m and its velocity at t = 0 s is –3 m/s. We are looking for the position and velocity at t = 4 s.

a. Place the given values into the following table.

the constant acceleration			
initial time		final time	
initial position		final position	
initial velocity		final velocity	

b. Here are the equations of motion. Which two would be best to use?

$$\Delta\vec{v} = \vec{a}\Delta t \qquad no\ \Delta\vec{x}$$

$$\Delta\vec{x} = \vec{v}_i\Delta t + \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_f$$

$$\Delta\vec{x} = \vec{v}_f\Delta t - \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_i$$

$$\Delta\left(\vec{v}^2\right) = 2\vec{a}\cdot\Delta\vec{x} \qquad no\ \Delta t$$

$$\Delta\vec{x} = \frac{1}{2}\left(\vec{v}_f + \vec{v}_i\right)\Delta t \qquad no\ \vec{a}$$

c. What will be the velocity at t = 4 s?

d. What will be the position at t = 4 s?

e. Fill in the entire table.

Problem 2

An object moves along the x axis with an acceleration of –1 m/s^2. Its position at t = 3 s is 5 m and its velocity at t = 3 s is –2 m/s. We are looking for the position and velocity at t = 8 s.

a. Place the given values into the following table.

the constant acceleration			
initial time		final time	
initial position		final position	
initial velocity		final velocity	

b. Here are the equations of motion. Which two would be best to use?

$$\Delta\vec{v} = \vec{a}\Delta t \qquad no\ \Delta\vec{x}$$
$$\Delta\vec{x} = \vec{v}_i\Delta t + \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_f$$
$$\Delta\vec{x} = \vec{v}_f\Delta t - \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_i$$
$$\Delta\left(\vec{v}^2\right) = 2\vec{a}\cdot\Delta\vec{x} \qquad no\ \Delta t$$
$$\Delta\vec{x} = \frac{1}{2}\left(\vec{v}_f + \vec{v}_i\right)\Delta t \qquad no\ \vec{a}$$

c. What will be the velocity at t = 8 s?

d. What will be the position at t = 8 s?

e. Fill in the entire table.

Problem 3

An object moves along the x axis with an acceleration of +4 m/s^2. Its position at t = 4 s is 20 m and its velocity at t = 4 s is +16 m/s. We are looking for the position and velocity at t = –2 s.

a. Place the given values into the following table.

the constant acceleration			
initial time		final time	
initial position		final position	
initial velocity		final velocity	

b. Here are the equations of motion. Which two would be best to use?

$$\Delta\vec{v} = \vec{a}\Delta t \qquad no\ \Delta\vec{x}$$
$$\Delta\vec{x} = \vec{v}_i\Delta t + \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_f$$
$$\Delta\vec{x} = \vec{v}_f\Delta t - \frac{1}{2}\vec{a}\Delta t^2 \qquad no\ \vec{v}_i$$
$$\Delta\left(\vec{v}^2\right) = 2\vec{a}\cdot\Delta\vec{x} \qquad no\ \Delta t$$
$$\Delta\vec{x} = \frac{1}{2}\left(\vec{v}_f + \vec{v}_i\right)\Delta t \qquad no\ \vec{a}$$

c. What was the velocity at t = –2 s?

d. What was the position at t = –2 s?

e. Fill in the entire table.