HW Set 5 Equations of Motion

Problem 1

An object moves along the x axis. Its position at t = 5 s is +16 m and its velocity at t = 5 s is +8 m/s. At an earlier time, its position was –4 m and its velocity was +2 m/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 earlier time?

d. What is the acceleration?

e. Fill in the entire table.

Problem 2

An object moves along the x axis with an acceleration of 4 m/s^2. From the time t = –3 s to the time t = 5 s, its position went from 2 m to 18 m.

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 was the velocity at t = –3 s?

d. What will be the velocity at t = 5 s?

e. Fill in the entire table.

Problem 3

An object moves along the x axis with an acceleration of –3 m/s^2. At an earlier time, the position is 4 m and the velocity is 9 m/s. At the later time t = 5 s, the position is –20 m.

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 first time?

d. What is the velocity at t = 5 s?

e. Fill in the entire table.