HW2-6 Soln)

We could do this in a manner similar to that of the car or rocket problems. That fact that we have a velocity v time graph suggests perhaps finding the displacement as the area under the curve.

$$\Delta x = \text{area} = \tfrac{1}{2}bh = \frac{1}{2}(13)7 = 45.5 \text{ m}$$

Using the equations:

For 0 to 4 seconds,

x_i = 0 m

x_f = ? ←

v_i = 0 m/s

v_f = +7 m/s

a = ? ←

t = 4 seconds

(1)

$$v_f = v_i + at$$

$$a = \frac{v_f - v_i}{t} = \frac{7-0}{4} = 1.75\ m/s^2$$

(3)

$$x = x_i + v_i t + \tfrac{1}{2}at^2$$

$$x = 0 + 0 + \tfrac{1}{2}(1.75)4^2 = 14\ m$$

Then, for 4 to 13 seconds,

x_i = 14 m

x_f = ? ←

v_i = +7 m/s m/s

v_f = 0 m/s

a = ? ←

t = 13 – 4 = 9 seconds

(1)

$$v_f = v_i + at$$

$$a = \frac{v_f - v_i}{t} = \frac{0 - 7}{9} = -0.78 \text{ m/s}^2$$

(3)

$$x = x_i + v_i t + \tfrac{1}{2}at^2$$

$$x = 14 + 7(9) + \tfrac{1}{2}(-0.78)9^2 = 45.5 \text{ m}$$