FREE FALL ON PLANET NEWTONIA

b) $A \to E$ $\bar{v} = \frac{\Delta \bar{x}}{\Delta t} = \frac{20\,m - 0\,m}{4\,s - 0\,s} = 5\ m/s$

c) $A \to C$ $\bar{v} = \frac{\Delta \bar{x}}{\Delta t} = \frac{8\,m - 0\,m}{2\,s - 0\,s} = 4\ m/s$

e) instantaneous velocity at the mid-time is equal to the average velocity of the event

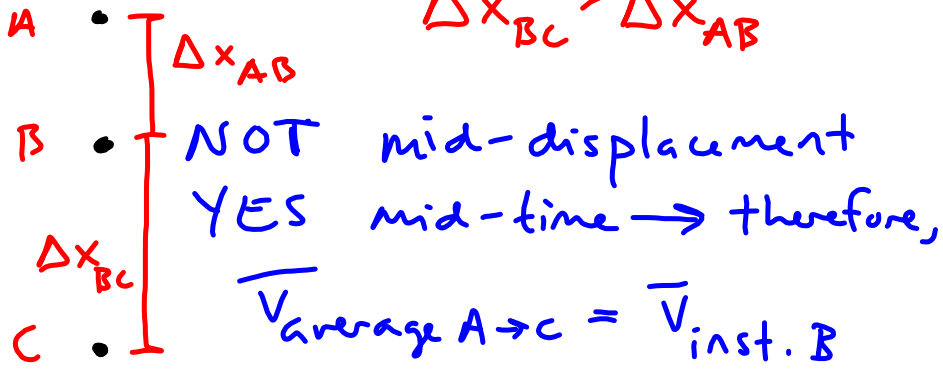
$\bar{v}_{\text{average } A \to C} = \bar{v}_{\text{inst. } B}$

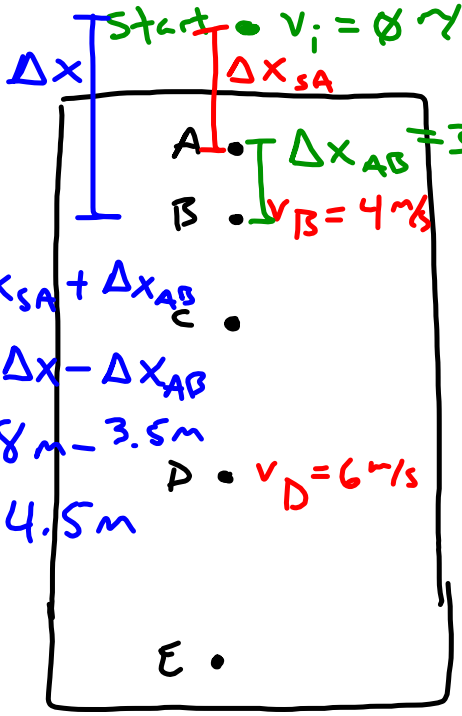
↳ B is at mid-time of $A \to C$

d) $C \to E$ $\bar{v} = \frac{\Delta \bar{x}}{\Delta t} = \frac{20m - 8m}{4s - 2s} = \frac{12\,m}{2\,s} = 6\ m/s$

f) $\bar{v}_{\text{average } C \to E} = \bar{v}_{\text{inst. } D} = 6\ m/s$

g) $\bar{a} = \frac{\Delta \bar{v}}{\Delta t} = \frac{\bar{v}_D - \bar{v}_B}{t_D - t_B} = \frac{6\ m/s - 4\ m/s}{4\,s - 2\,s} = \underline{1}\ m/s^2$


A
B
C
Δx_{AB}
Δx_{BC}
$\Delta x_{BC} > \Delta x_{AB}$
NOT mid-displacement
YES mid-time → therefore,
$\overline{v}_{average\ A \to C} = \overline{v}_{inst.\ B}$



$a = 1\ m/s^2$ $\downarrow_+$

$\Delta x = \Delta x_{SA} + \Delta x_{AB}$

$\Delta x_{SA} = \Delta x - \Delta x_{AB}$

$= 8m - 3.5m$

$= 4.5m$

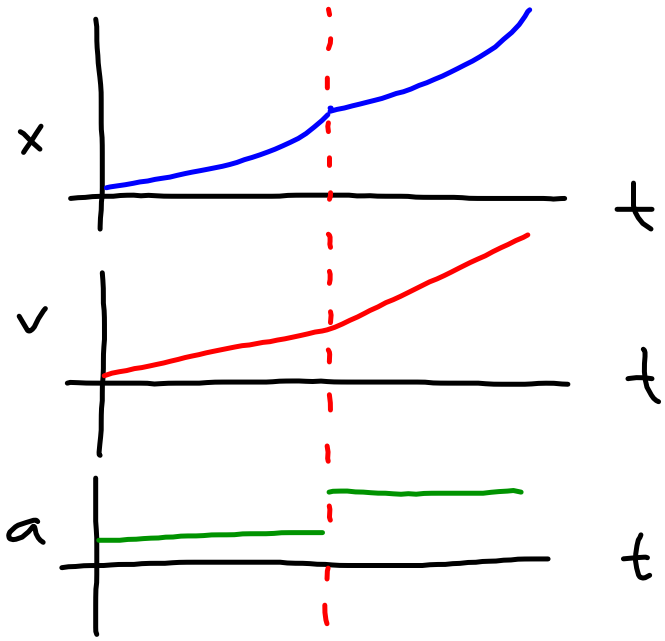
$v_f^2 = v_i^2 + 2a\Delta x$

$\Delta x = \frac{v_f^2 - v_i^2}{2a}$

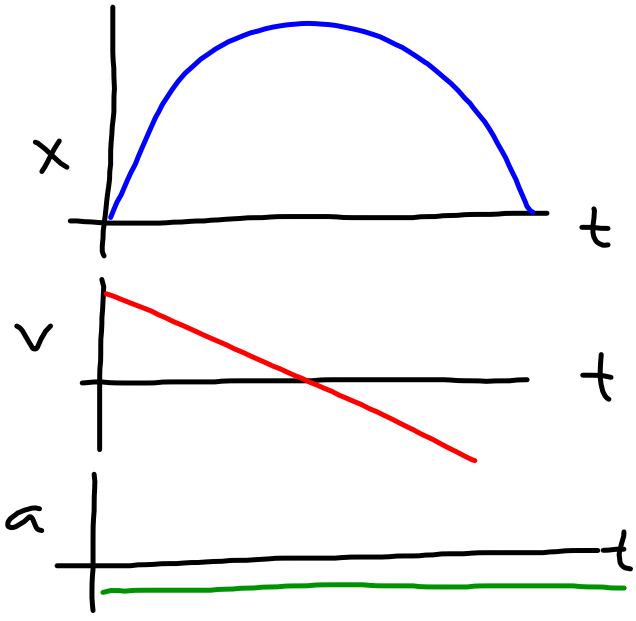
$= \frac{(4\ m/s)^2 - (0\ m/s)^2}{2(1\ m/s^2)}$

$= 8\ m$

3)

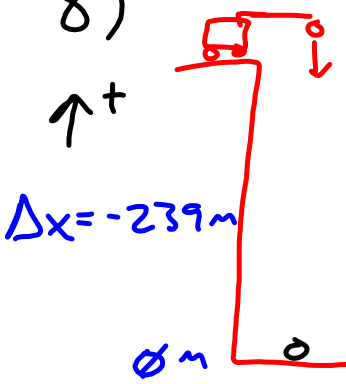


4)



HANG TIME

8)



$v_i = 0\ m/s$

$a = -3.7\ m/s^2$

$t = ?$

$v_f = ?$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$v_f = \pm\sqrt{v_i^2 + 2a\Delta x}$$

$$= -\sqrt{(0\ m/s)^2 + 2(-3.7\ m/s^2)(-239\ m)}$$

$$= -42.06\ m/s$$

$$v_f = v_i + at$$

$$t = \frac{v_f - v_i}{a}$$

$$= \frac{-42.06\ m/s - 0\ m/s}{-3.7\ m/s^2}$$

$$= 11.37\ s$$