6. (a) because the increase of the acceleration is linear in time.

$a = a_0 + ct$ here $c = \dfrac{9.43 - 8.78}{1} \dfrac{m/s^2}{hour}$

$\uparrow$ the original acceleration $= 0.65\ m/s^2/hour$

$v = \int a\,dt$

$= v_0 + a_0 t + \frac{1}{2}ct^2$

$\uparrow$ original speed

$x = \int v\,dt$

$= x_0 + v_0 t + \frac{1}{2}a_0 t^2 + \frac{1}{6}ct^3 = x_0 + v_0 t + \frac{1}{2}a_0 t^2 + \frac{1}{6}ct^3$

$\uparrow$ original position

(b) select downward to be $+x$ direction. $v_0 = -25 m/s$ $a_0 = 8.78 m/s$

if $x = x_0$, then

$x = x_0 = x_0 + v_0 t + \frac{1}{2}a_0 t^2 + \frac{1}{6}ct^3$

$\Rightarrow v_0 t + \frac{1}{2}a_0 t^2 + \frac{1}{6}ct^3 = 0$

$t\,(v_0 + \frac{1}{2}a_0 t + \frac{1}{6}ct^2) = 0$

then $ct^2 + 3a_0 t + 6v_0 = 0$ *

$t = \dfrac{-3a_0 + \sqrt{9a_0^2 - 4 \cdot c \cdot 6v_0}}{2c} = \dfrac{-3a_0 + \sqrt{9a_0^2 - 24v_0 c}}{2c}$

$v = v_0 + a_0 t + \frac{1}{2}ct^2$

$= v_0 + a_0 t + \frac{1}{2}(\underbrace{ct^2}_{-3a_0 t - 6v_0})$ *

$= v_0 + a_0 t - \frac{3}{2}a_0 t - 3v_0$

$= -2v_0 - \frac{1}{2}a_0 t$

$= -2v_0 - \frac{1}{2}a_0 \dfrac{-3a_0 + \sqrt{9a_0^2 - 24v_0 c}}{2c} \doteq 25.00098\ m/s$

it's faster compared to the speed it would have (25 m/s)