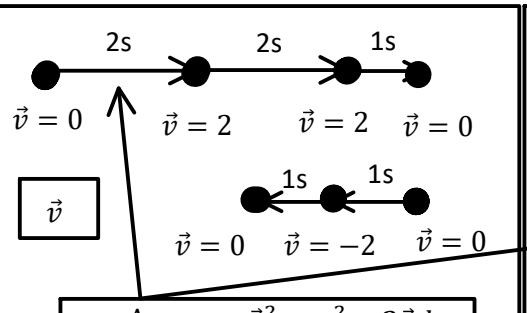
C12 - 5.1 - $\vec{v}$ vs t Notes

$\vec{v} = velocity\ (\frac{m}{s})$

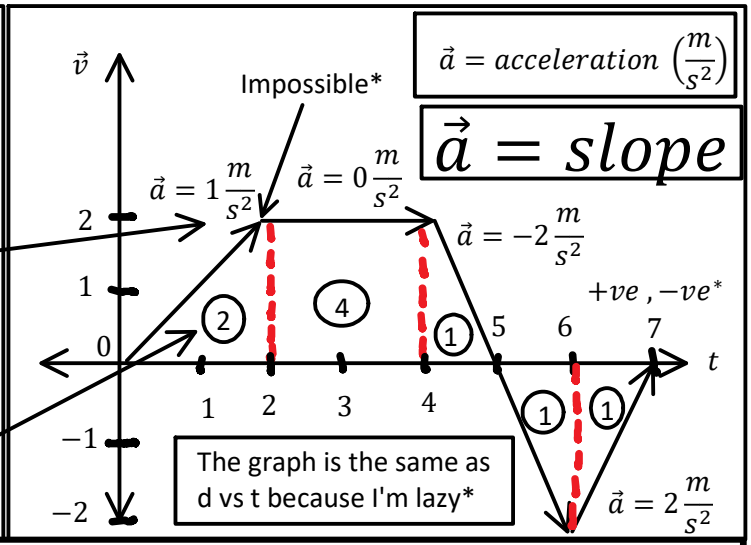
You start from rest and accelerate East at 1 m/s^2 for 2s then run for 2s at constant speed then slow down at 2 m/s^2 to a stop and run backwards speeding up at 2 m/s^2 for 1s then slow down to a stop in 1s.



$\vec{a} = \frac{\Delta v}{\Delta t}$ $\quad \vec{v}_f^2 = \vec{v}_i^2 + 2\vec{a}d$

$\vec{a} = \frac{2}{2} = (1\frac{m}{s^2})$ $\quad d = \frac{\vec{v}_f^2}{2\vec{a}}$

$d = \frac{2^2}{2(1)} = 2m$

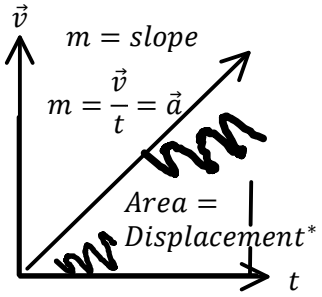


$\vec{a} = acceleration\ (\frac{m}{s^2})$

$\vec{a} = slope$

t	$\vec{v}$
0	0
1	1
2	2
3	2
4	2
5	0
6	−2
7	0

$m = \frac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1}$



Velocity vs Time

$\vec{a}_{(0,2)} = \frac{2-0}{2-0}$ $\quad \vec{a}_{(2,4)} = \frac{2-2}{4-2}$

$\vec{a}_{(0,2)} = 1\frac{m}{s^2}\ [E]$ $\quad \vec{a}_{(2,4)} = 0\frac{m}{s^2}\ [E]$

$\vec{a}_{(4,6)} = -2\frac{m}{s^2}\ or\ 2\frac{m}{s^2}\ [W]$

$displacement = area$

$a = \frac{bh}{2}$ $\quad a = \frac{(2)(2)}{2}$ $\quad a = 2$

$d = 2m$

$a = lw$ $\quad a = (2)(2)$ $\quad a = 4$

$d = 4m$

$a = \frac{bh}{2}$ $\quad a = \frac{(1)(2)}{2}$ $\quad a = 1$

$d = 1m$

Constant Velocity : Horizontal Line
Zero Velocity : $x - int$
Positive Velocity : Above $x - axis$
Negative Velocity : Below $x - axis$
Acceleration : Slope
Speeding Up : $\vec{a}$ & $\vec{v}$ *same sign*
Slowing Down : $\vec{a}$ & $\vec{v}$ *opposite sign*
Displacement : Area*

Find the total Distance Travelled and Displacement.

$Distance = 2 + 4 + 1 + 1 + 1$

$Distance = 9\ m$

$Displacement = 2 + 4 + 1 - 1 - 1$

$Displacement = 5\ m$

$slope = \vec{a}$

$m = \frac{\vec{v}_2 - \vec{v}_1}{t_2 - t_1} = \frac{\Delta\vec{v}}{\Delta t} = \vec{a}$ $\quad \Delta = change\ in$ $\quad \vec{a} = \frac{d}{dt}\vec{v}(t)$ Leibniz Notation Derivatives Calc 12