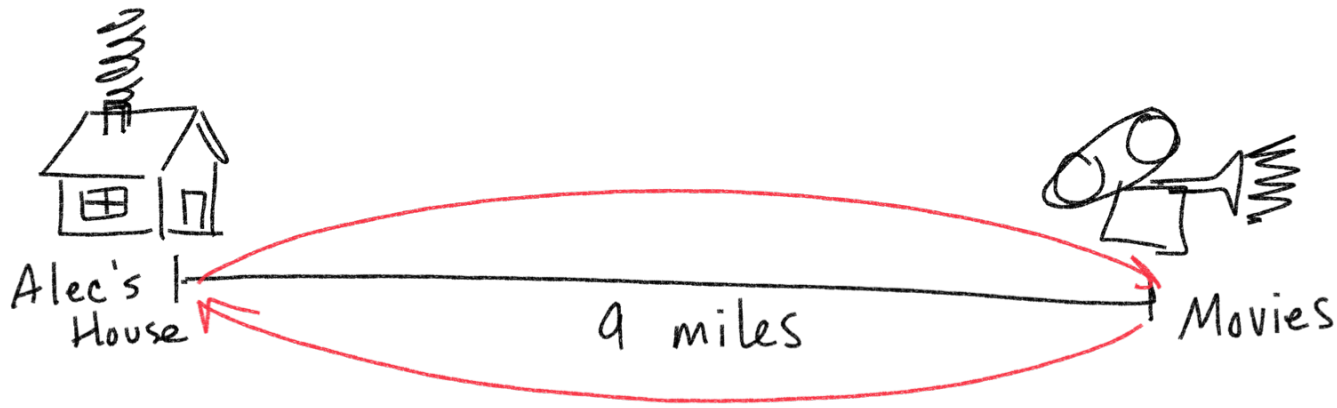
TH-GP General Physics Week 5 10/12



Total distance traveled : 18 miles

Distance - total path length traveled

Total displacement : 0 miles

Displacement → not a path length

Displacement $\Delta X = X_f - X_i$

Delta (change)

final position

initial position

Distance

scalar quantity

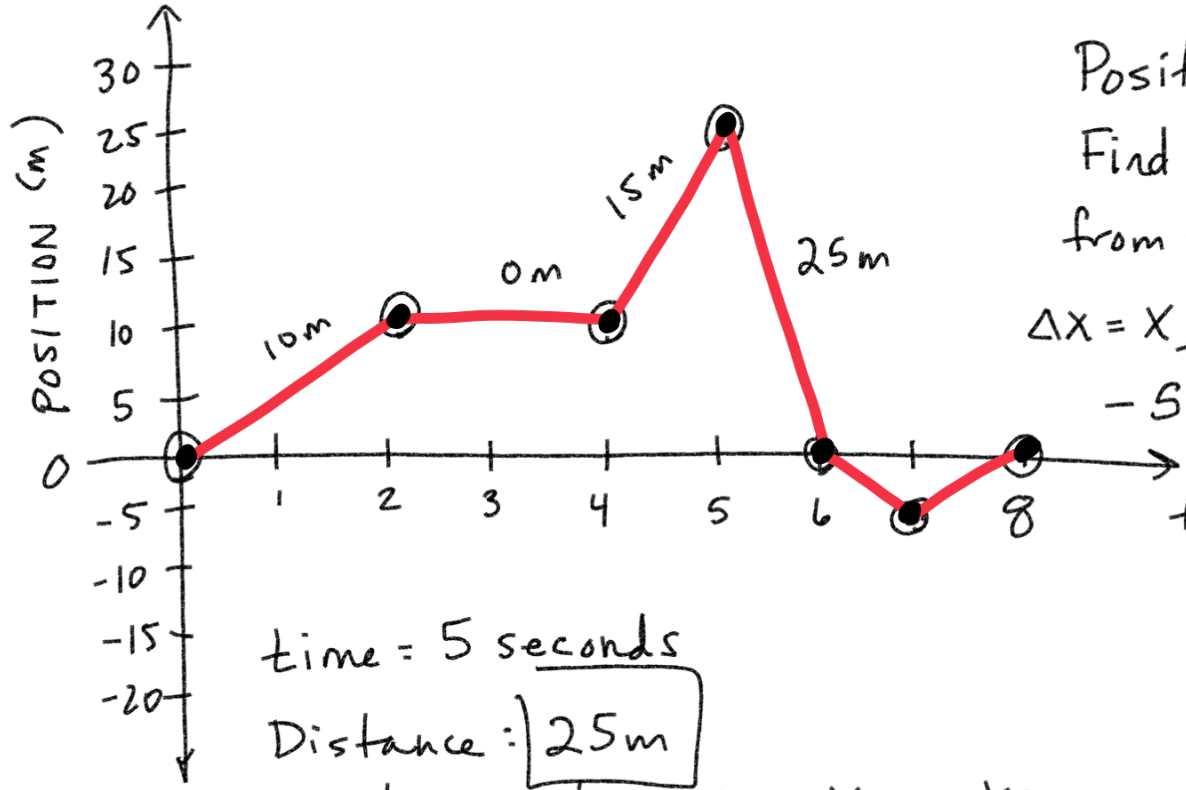
absolute value quantity

- magnitude

Displacement

vector quantity

- magnitude and direction



Position Vs Time

Find ΔX

from $t_i = 4s$ $t_f = 7s$

$\Delta X = X_f - X_i$

$-5m - 10m =$ $\boxed{-15m}$

time = 5 seconds

Distance: $\boxed{25m}$

Displacement: $\Delta X = X_f - X_i$

$25m - 0m = \boxed{25m}$

time = 6 seconds

Distance: $10m + 15m + 25m = \boxed{50m}$

Displacement: $\Delta X = X_f - X_i$

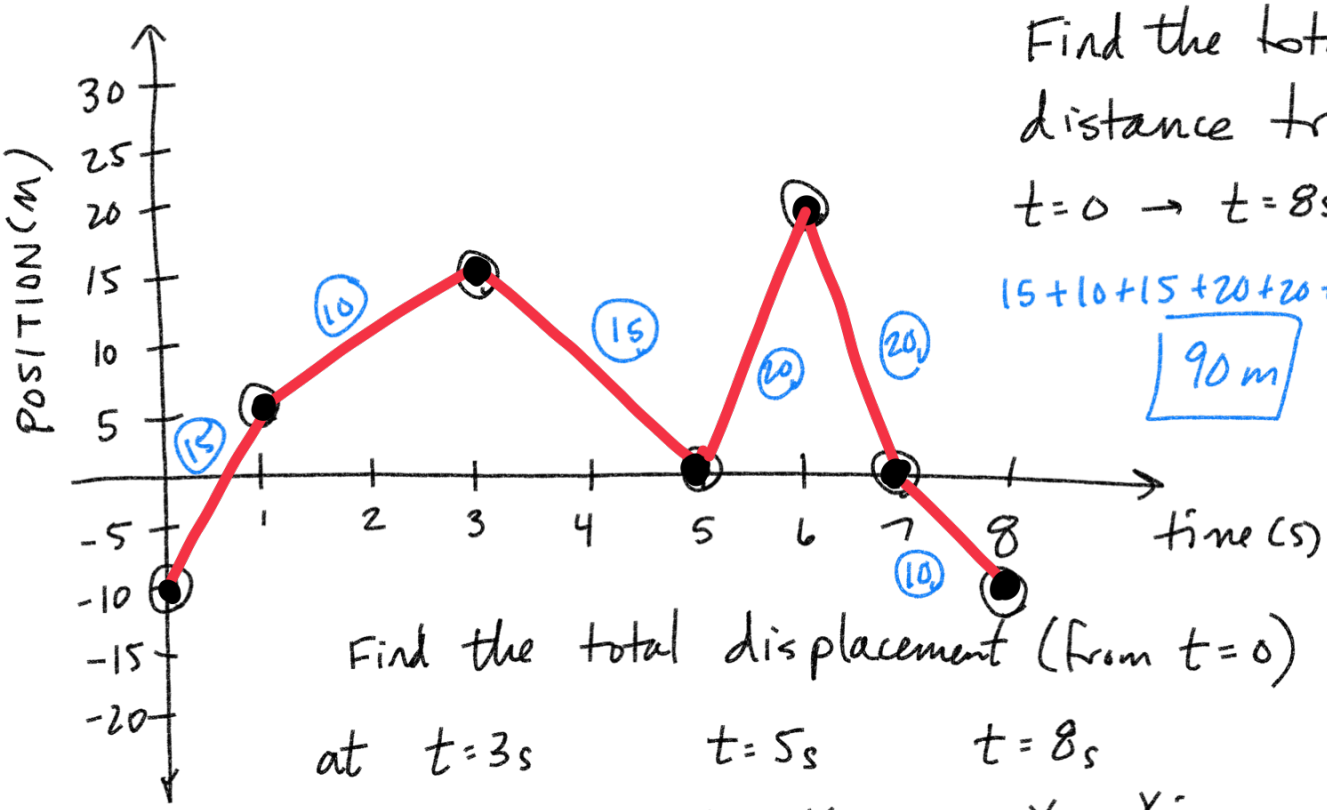
$0m - 0m = \boxed{0m}$

time = 7 seconds

Distance: 55m

Displacement: $\Delta X = X_f - X_i$

$-5m - 0m = \boxed{-5m}$



Find the total distance traveled

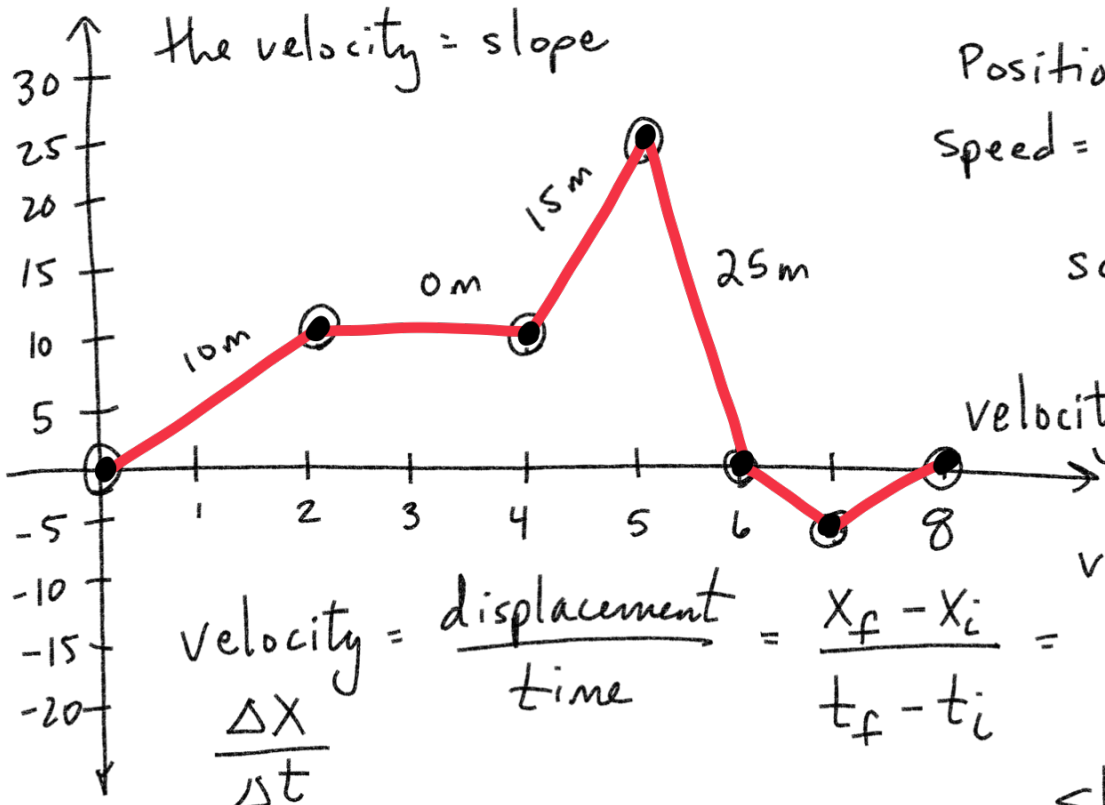
$t=0 \rightarrow t=8s$

$15+10+15+20+20+10$

$\boxed{90\,m}$

Find the total displacement (from $t=0$)

at $t=3s$	$t=5s$	$t=8s$
$\Delta X = X_f - X_i$	$X_f - X_i$	$X_f - X_i$
$15m - (-10m)$	$0m - (-10m)$	$-10m - (-10m)$
		$-10m + 10m$
$\boxed{25m}$	$\boxed{10m}$	$\boxed{0m}$



Position Vs Time

$\text{Speed} = \frac{\text{distance}}{\text{time}}$

scalar

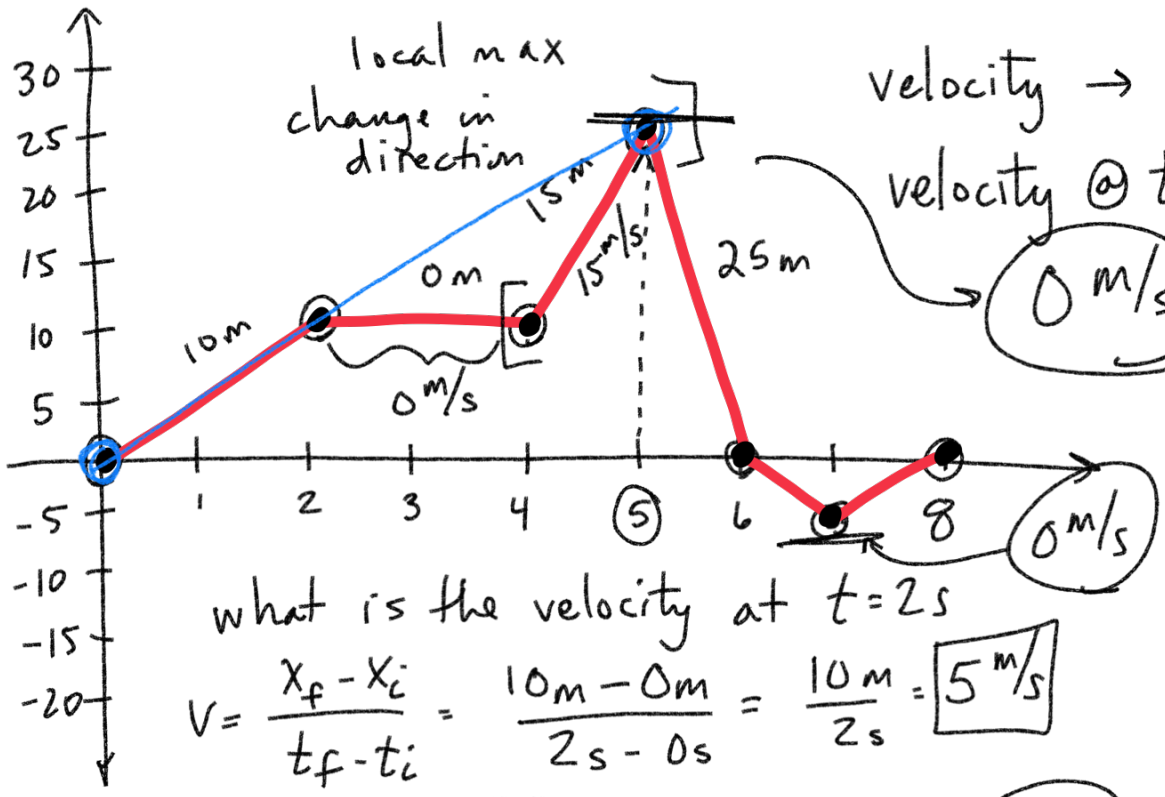
$\text{velocity} = \frac{\text{displacement}}{\text{time}}$

vector

$\text{velocity} = \frac{\text{displacement}}{\text{time}} = \frac{X_f - X_i}{t_f - t_i} = \frac{y_2 - y_1}{X_2 - X_1}$

$\frac{\Delta X}{\Delta t}$

slope



velocity → slope

velocity @ $t = 5s$

$0\ m/s$

what is the velocity at $t = 2s$

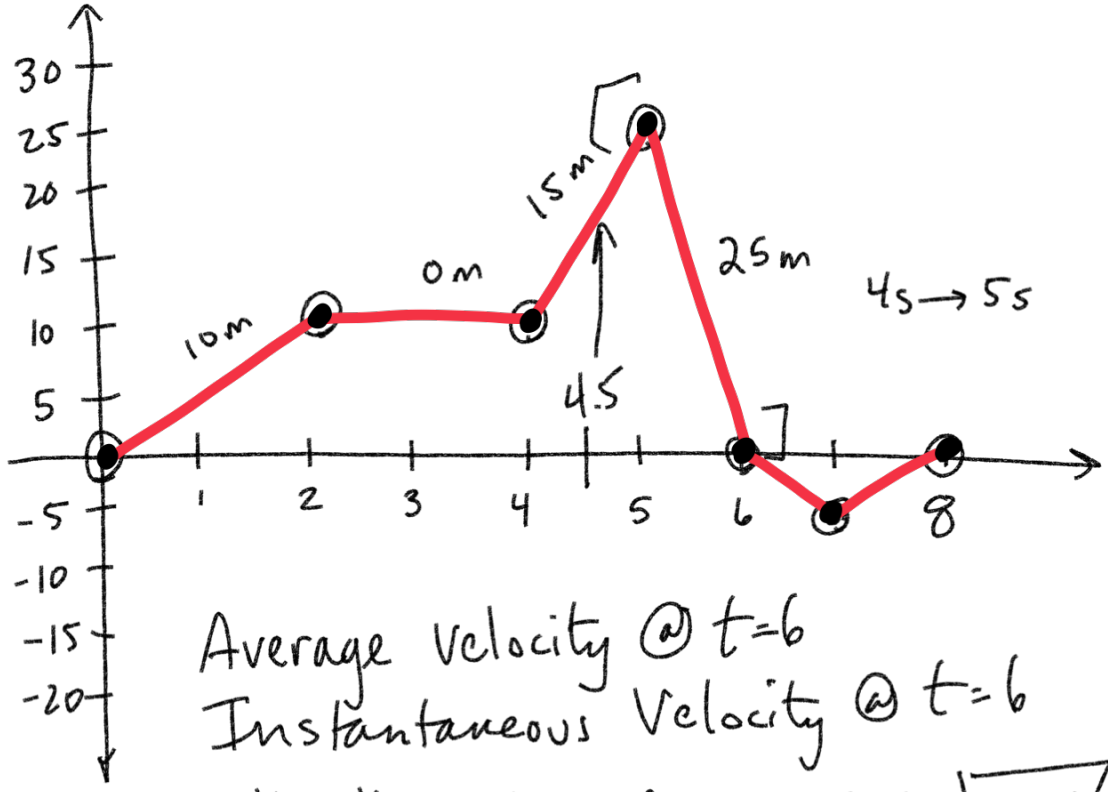
$$V = \frac{x_f - x_i}{t_f - t_i} = \frac{10m - 0m}{2s - 0s} = \frac{10m}{2s} = \boxed{5\ m/s}$$

average velocity $\bar{v}$ $t = 0s \rightarrow t = 5s$

$$\bar{V} = \frac{x_f - x_i}{t_f - t_i} = \frac{25m - 0m}{5s - 0s} = \frac{25m}{5s} = \boxed{5\ m/s}$$

instantaneous velocity $4s \rightarrow 5s$

$$V = \frac{x_f - x_i}{t_f - t_i} = \frac{25m - 10m}{5s - 4s} = \frac{15m}{1s} = \boxed{15\ m/s}$$

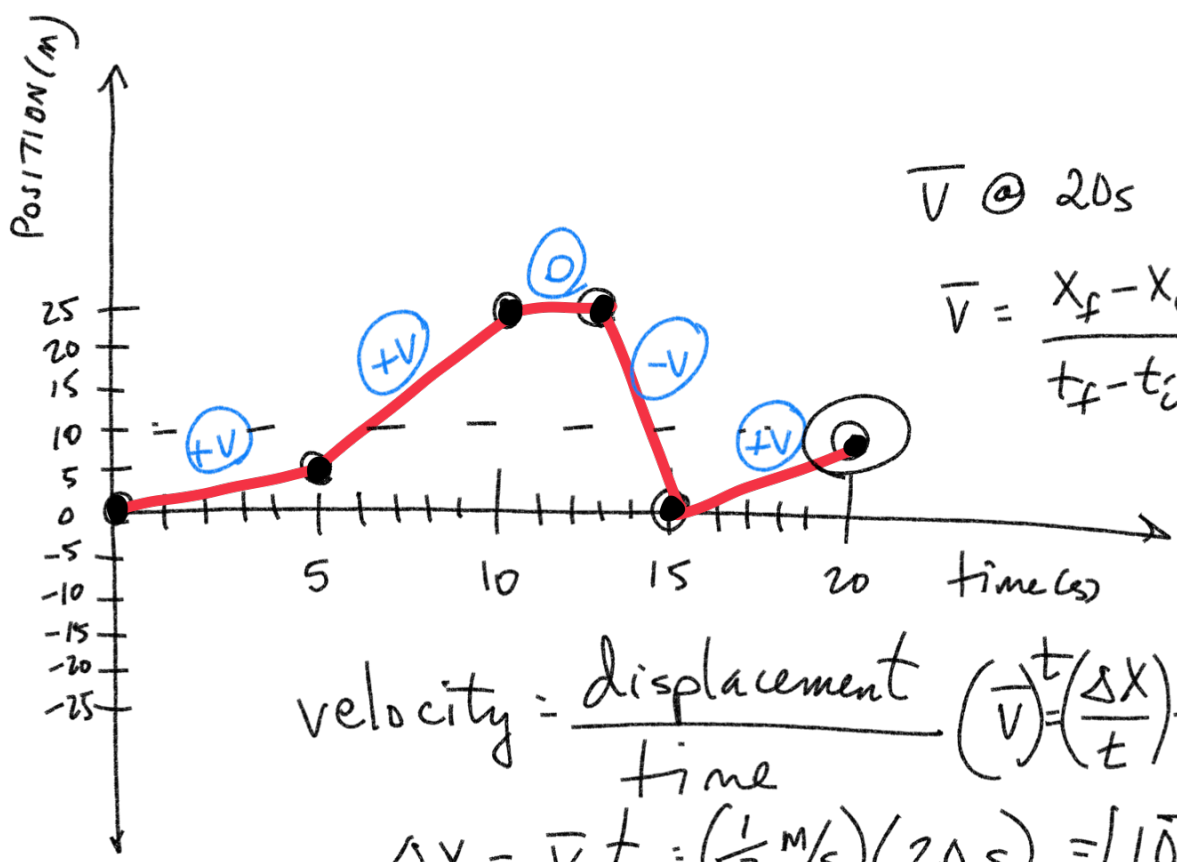


Average velocity @ $t=6$

Instantaneous Velocity @ $t=6$

$$\bar{V} = \frac{x_f - x_i}{t_f - t_i} = \frac{0\,m - 0\,m}{6\,s - 0\,s} = \frac{0\,m}{6\,s} = \boxed{0\ m/s}$$

$$V = \frac{x_f - x_i}{t_f - t_i} = \frac{0\,m - 25\,m}{6\,s - 5\,s} = \frac{-25\,m}{1\,s} = \boxed{-25\ m/s}$$



$\bar{V}$ @ 20s

$$\bar{V} = \frac{x_f - x_i}{t_f - t_i} = \frac{10\,m - 0\,m}{20\,s - 0\,s}$$

$$\frac{10}{20}\ m/s$$

$$\boxed{\frac{1}{2}\ m/s}$$

$$\text{velocity} = \frac{\text{displacement}}{\text{time}} \qquad \left(\bar{V}\right)t = \left(\frac{\Delta x}{t}\right)t$$

$$\Delta x = \bar{V}t = \left(\tfrac{1}{2}\ m/s\right)(20\ s) = \boxed{10\ m}$$