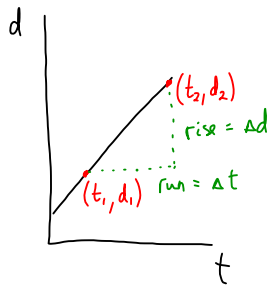


Position-Time Graphs and Velocity

Constant Velocity



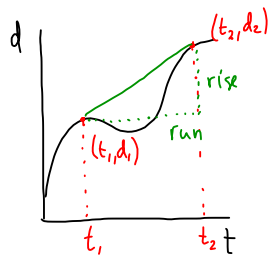
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$\text{slope} = \frac{\Delta d}{\Delta t}$$

From investigation 3, we know that slope (d-t) = velocity

$$v = \frac{\Delta d}{\Delta t}$$

Non-Constant Velocity

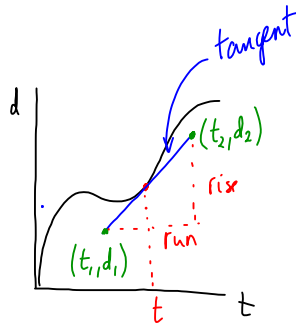


$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$\text{slope} = \frac{\Delta d}{\Delta t}$$

$$v_{\text{ave}} = \frac{\Delta d}{\Delta t}$$

The average velocity is the slope between two points on a position-time graph



$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

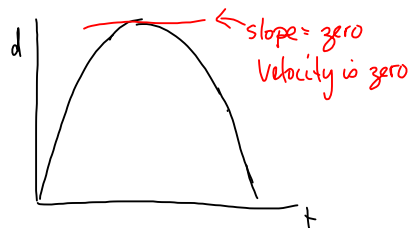
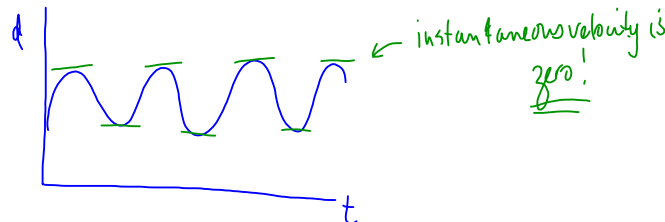
$$\text{slope} = \frac{\Delta d}{\Delta t}$$

$$v_{\text{inst}} = \frac{\Delta d}{\Delta t}$$

The instantaneous velocity is the slope of the tangent drawn at time t.

With your math background you can only "eye-ball" the tangent line to find instantaneous velocity.

Alternatively you could use calculus or technology.



Terminology

position (\vec{d}) - where you are in relation to a reference point
(vector) ex. 5 km [E]

displacement ($\Delta\vec{d}$) - where you are now in relation to where you started; change in position
(vector) ex. 20 km [N30°E]

distance (Δd) - how far you travelled.
(scalar) ex. 200 km

velocity (\vec{v}) - rate of change in your position.
(vector) ex. 25 km/h [N]

speed (v) - how fast you cover the distance.
(scalar)

Using the velocity equation:

$$\vec{v} = \frac{\Delta\vec{d}}{\Delta t}$$

← displacement
← should be able to rearrange for Δd or Δt .

$$v = \frac{\Delta d}{\Delta t}$$

speed → ← distance

Scalars have only magnitude (size)
vectors have magnitude AND direction.

Solving Problems using the velocity equation:

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$$

If we want to solve for $\Delta \vec{d}$:

$$\Delta \vec{d} = \vec{v} \Delta t$$

If we want to solve for Δt :

$$\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$$

$$\vec{v} \Delta t = \Delta \vec{d}$$

$$\Delta t = \frac{\Delta \vec{d}}{\vec{v}}$$

GRASP

Given

Required

Analysis - find an equation
and rearrange as necessary

Solution - sub in your numbers
and do the calculation

Paraphrase - write a sentence.