TEST (INTRO + MOTION)

Intro

- accuracy + precision (least count)
- scientific notation
- metric conversions
- significant digits (count + do calculations)
- data analysis
  - line of best fit ($y = mx + b$)
  - interpolation + extrapolation
- factor labelling

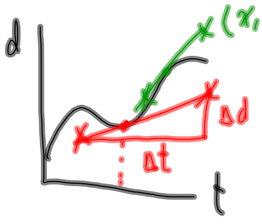
Motion

- d-t graph ↔ description
- ticker tape diagrams ↔ description
- find velocity from slope
- d-t graph $\xrightarrow{\text{slope}}$ v-t graph (sketch or quantitative)
- velocity problems using $\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$

Speed: $v = \frac{\Delta d}{\Delta t}$ ← distance   velocity: $\vec{v} = \frac{\Delta \vec{d}}{\Delta t}$ ← displacement

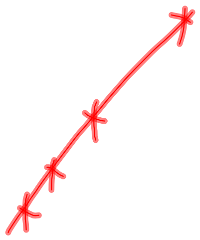
- car chase problems
- motion terminology
  vector, scalar, position, distance,
  displacement, speed, velocity
- constant / average / instantaneous velocity from d-t graph

constant slope   line b/w two points   tangent



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

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

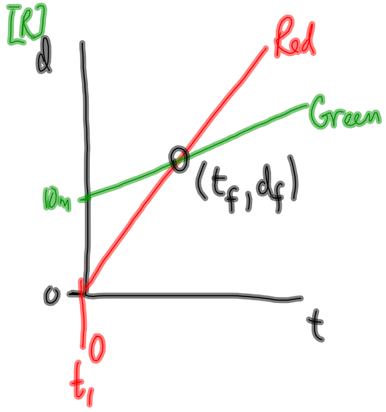


Chase Problem

Red Car: $\vec{v} = 25 m/s \overset{+}{[R]}$ and $\vec{d}_i = 0m$

Green Car: $\vec{v} = 15 m/s [R]$ and $\vec{d}_i = 10m [R]$

Where and when will the red car pass the green car if they are travelling in side by side lanes?



Red Car

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

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

$$\vec{d}_f - \underset{0}{\cancel{\vec{d}_i}} = \vec{v}(t_f - \underset{0}{\cancel{t_i}})$$

$$\vec{d}_f = \vec{v} t_f$$

$$\boxed{\vec{d}_f = (25 m/s [R]) t_f}$$

$$(y = m x + b)$$

final position velocity final time initial position

Green:

$$y = mx + b$$

$$\boxed{\vec{d}_f = (15 m/s [R]) t_f + 10m}$$

$$\overset{\cancel{-15m/s\, t_f}}{\cancel{(15 m/s [R]) t_f}} + 10m [R] = (25 m/s [R]) t_f - 15 m/s\, t_f$$

$$\frac{10m [R]}{10m/s [R]} = \frac{\cancel{(10m/s [R])} t_f}{\cancel{10m/s [R]}}$$

$$\boxed{t_f = 1s}$$

$$\frac{m}{m/s} = m \div \frac{m}{s}$$

$$= \cancel{m} \cdot \frac{s}{\cancel{m}}$$

Sub into:

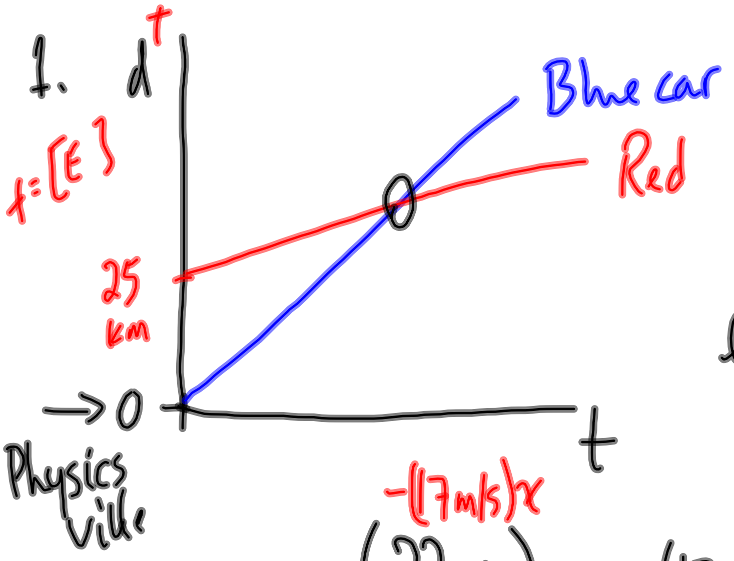
$$\vec{d}_f = (25 m/s [R]) t_f$$

$$\vec{d}_f = (25 m/s [R])(1s)$$

$$\boxed{\vec{d}_f = 25m [R]}$$

The red car will catch up with the green in 1s at 25m [R]

1.



$y = (22\,m/s)x + 0$

$y = (17\,m/s)x + 25000\,m$

let x be the time

y be the final position

$$\overset{-(17\,m/s)x}{(22\,m/s)x} = \overset{-(17\,m/s)x}{(17\,m/s)x + 25000\,m}$$

$$\frac{(5\,m/s)x}{5\,m/s} = \frac{25000\,m}{5\,m/s}$$

$$x = 5000\,s$$