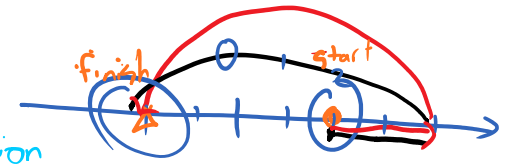
Constant Velocity Motion

Tuesday, September 22, 2009 10:06 AM



Position is your location at any moment

Displacement is separation from a starting place after moving WITH A DIRECTION, measured in meters (m)
Variable in equations is d

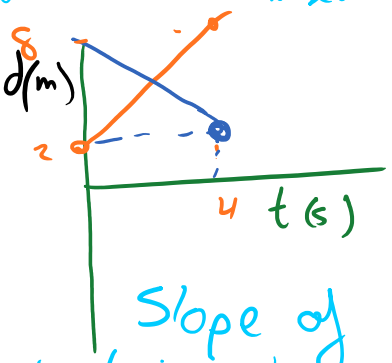
vector Δposition = final − initial
= −2 − 2 = −4 m

Distance is similar but different, distance is total number of meters travelled from a starting point, measured in meters (m)
Variable in equations is d

Scalar ← no direction ← ± aren't used

Velocity is the rate of change of displacement

÷ by time it takes — vector



Slope of d vs t is velocity

Speed is rate of change of distance $v = \frac{\Delta d}{\Delta t}$

scalar

Example:

A cat travels from the 1.0 meter mark as shown below to the 5.0 m mark then to the 3.0 m mark find the position, distance travelled and the displacement of the cat at the end.

Time is a measurement of change in the universe. Most physical variables change as time passes. Time is a dimension in space like left/right, up/down, in/out. Time is measured in seconds (s).
Variable in equations is t

RATE measured by time

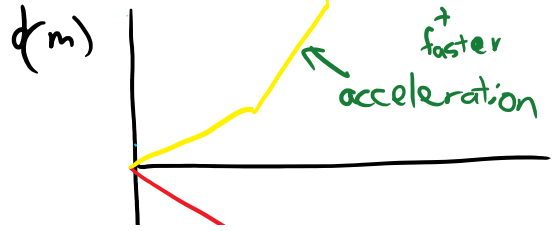
Determine how many seconds there are in a 1.25 hour long physics class.

Unit conversion → by multiplying

Velocity is a speed WITH A DIRECTION, measured in meters per second (m/s)
Variable in equations is v

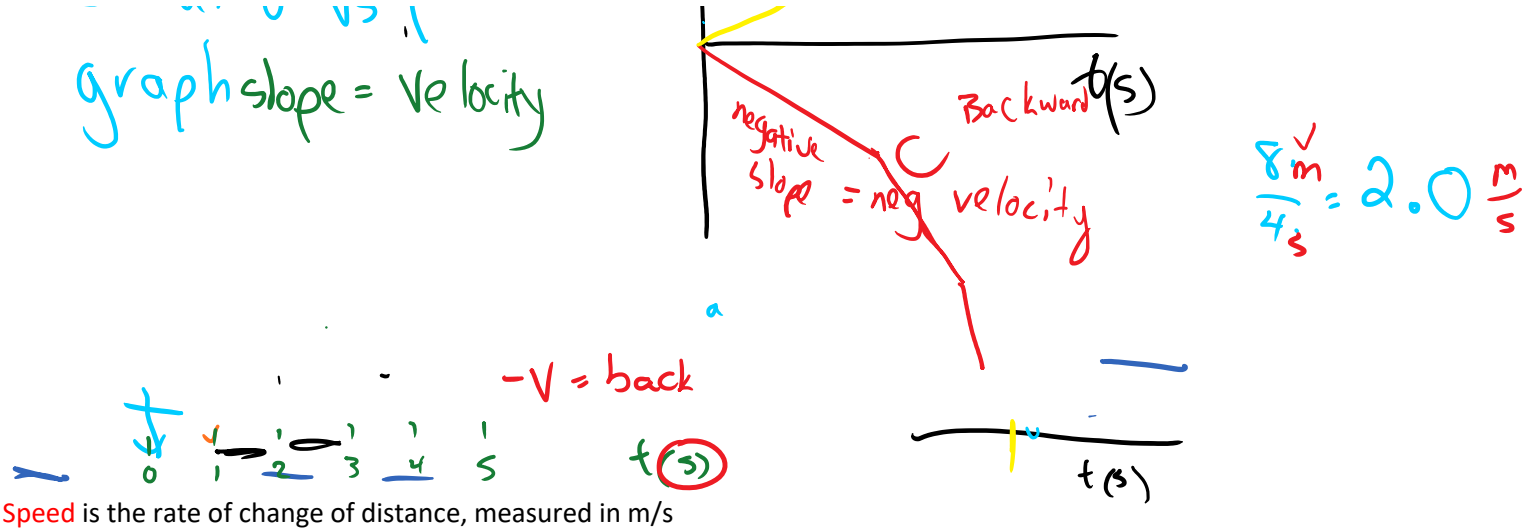
Velocity is the rate of change of displacement

Once upon a time there was a rabbit named Zip, and Zip was at rest



On a d vs t graph slope = velocity

slope displacement vs time = velocity



Speed is the rate of change of distance, measured in m/s

Variable in equations v

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

Δ Displacement = velocity
Δ Time

find the velocity of the cat below:

A cat is dragged by a car 16.0 m [E] in 4.0 s find the speed and velocity of the cat.

Δd / Δt = speed or velocity

$\frac{\Delta d}{\Delta t}$ = velocity = 16 m [E] / 4 s = 4.0 m/s [E]

A cat is kicked from 1.0 m [E] to 5.0 m [E] then pitch-forked to 3.0 m [E] all in 4.0 seconds, find the speed and velocity.

REMEMBER: Slope = rise/run = $\frac{\Delta y}{\Delta x}$

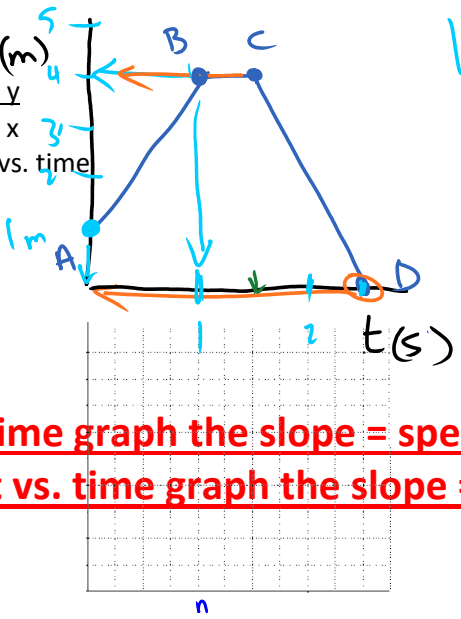
On a graph of displacement vs. time

find velocity from

A→B

B→C

C→D



$V_{AB} = \frac{\Delta d_{AB}}{\Delta t_{AB}} = \frac{4_m - 1_m}{1_s - 0_s} = 3.0\frac{m}{s}$ Right

$V_{BC} = \Delta d_{BC}$ $(4-4)_m = 0$

$\Delta t_{BC} = (1.5-1)_s = .5$

On a distance vs. time graph the slope = speed

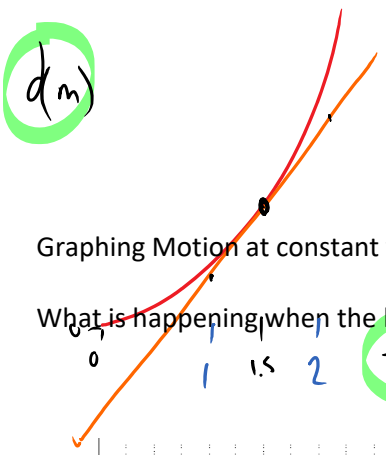
On a displacement vs. time graph the slope = velocity

$V_{CD} = \frac{(0-2)^m}{(2.5-1.5)s}$ Reverse direction

$= -4.0\frac{m}{s}$

$4.0\frac{m}{s}$ left

A linear graph of d vs. t will show a constant velocity



velocity is changing ← increasingly

on d vs. t slope ← speed or velocity positive

Graphing Motion at constant velocity or constant speed on d vs. t will give a straightline

What is happening when the line is exponential?

accelerating forward

you can estimate the velocity on a curving d vs t graph

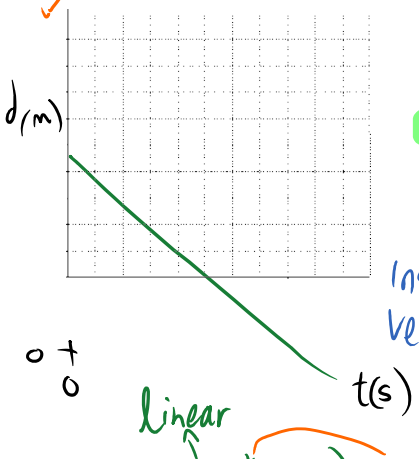
You are asked for velocity at exactly 1.5 s

① Make pt at the given time

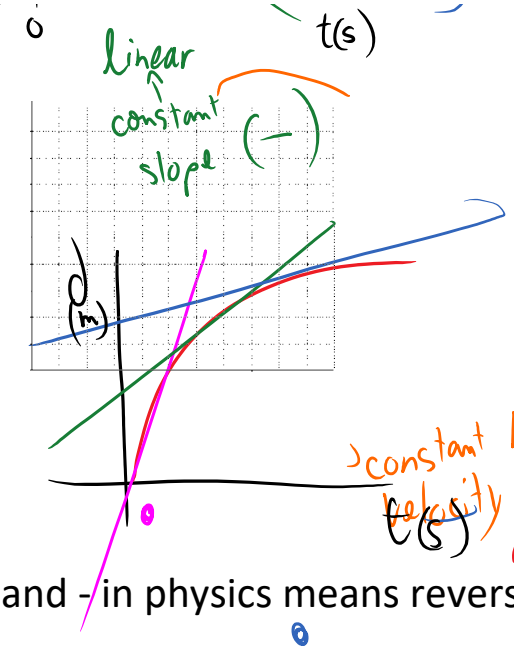
② Draw a tangent line ← touch at point but does not cross the curve

③ find slope of tangent

Instantaneous velocity



linear



constant backward velocity

+slope ← + V

less velocity

decelerating forward

not linear ← changing V

+ and - in physics means reverse direction

0

0

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