

06 October 2020 08:59

• "objects in motion"

distance  $d$   
displacement  $s$   
speed  $S$   
velocity  $v$   
acc  $a$

Equations of motion

• acc = rate of change of velocity

$a = \frac{\text{change in velo}}{\text{time}}$

$a = \frac{v-u}{t}$

$v = u + at$  (1)

• distance = Speed x time

$d = S \times t$  (speed is CONSTANT)

if speed is NOT constant

distance = Average Speed x time

displacement = Average velo. x time

$s = \left(\frac{u+v}{2}\right) \times t$  (2)

• 3rd Eq  $s = ut + \frac{1}{2}at^2$  derive.  
Subs. 'v' from eq (1) into eq (2)

$v = u + at$  |  $s = \left(\frac{u+v}{2}\right) \times t$   
 $s = \left(\frac{u+(u+at)}{2}\right) \times t$

$s = ut + \frac{1}{2}at^2$  (3)

• 4th Eq  $v^2 = u^2 + 2as$  derive  
make 't' the subject from eq (1) & replace it in eq (2)

$v = u + at$

$t = \frac{v-u}{a}$

$s = \left(\frac{u+v}{2}\right) \times t$   
 $s = \left(\frac{u+v}{2}\right) \times \left(\frac{v-u}{a}\right)$

simplify

$v^2 = u^2 + 2as$  (4)

These equations are to be used under the following conditions.

(1) object must be moving in a straight line. (Linear motion)

(2) The acceleration of the object must be constant.

example (1)

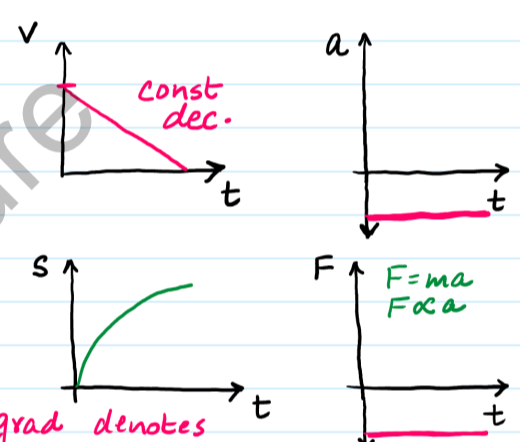
40m/s → 20m/s → REST

60m |  $s = ??$

$v^2 = u^2 + 2as$   
 $20^2 = 40^2 + 2a(60)$   
 $a = -10$   
const. dec

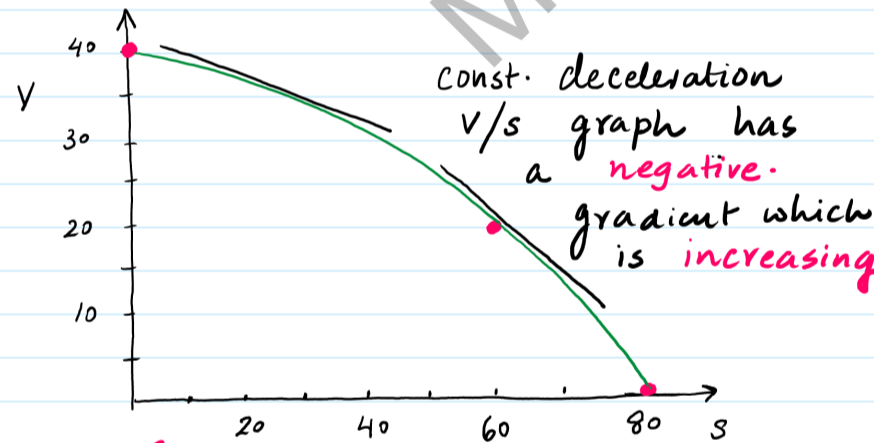
$v^2 = u^2 + 2as$   
 $0^2 = 20^2 + 2(-10)s$   
 $s = 20m$

sketch



grad denotes velocity. Since velocity decreases ∴ grad must also decrease

(b) Sketch a velocity against displ graph (v vs s)

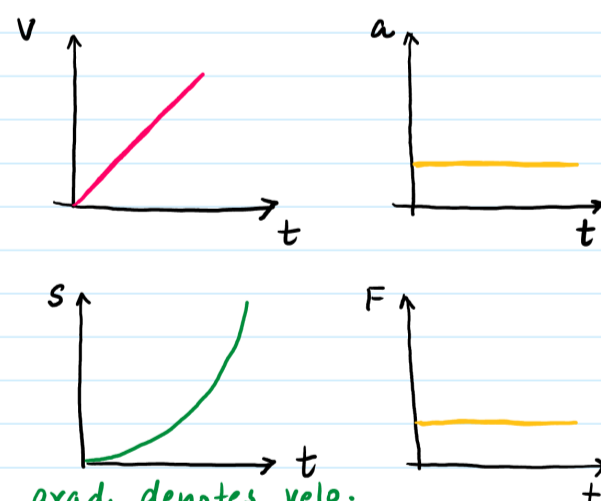


Q: rest → 15m/s → 30m/s

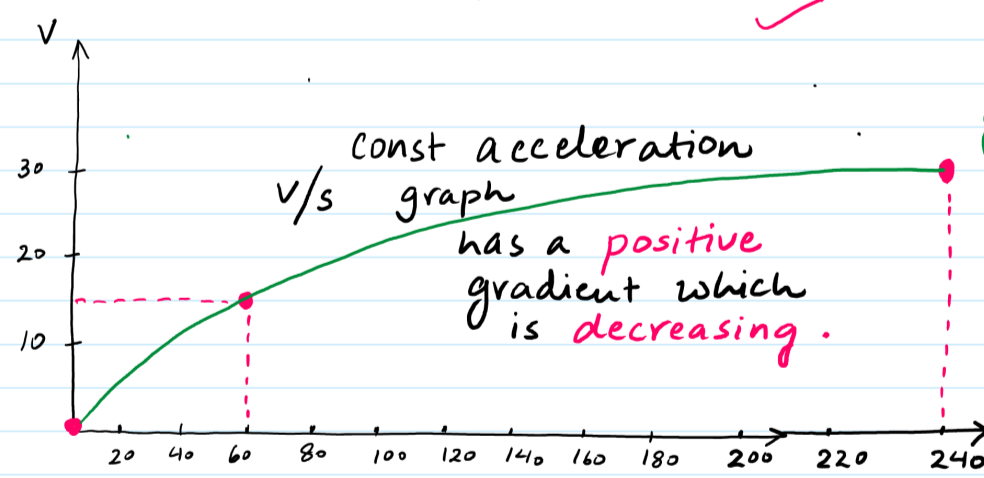
$s = 60m$  |  $s = ??$

$v^2 = u^2 + 2as$   
 $15^2 = 0^2 + 2a(60)$   
 $a = 1.875 \text{ m/s}^2$

$v^2 = u^2 + 2as$   
 $30^2 = 15^2 + 2(1.875)s$   
 $s = 180m$



grad denotes velo. since v inc. ∴ grad also inc.



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