

# YAKEEN NEET 2.0

**2026**

*Kinematics - -*

**Motion in a straight line**

**PHYSICS**

**Lecture - 07**

**By - Saleem Ahmed Sir**



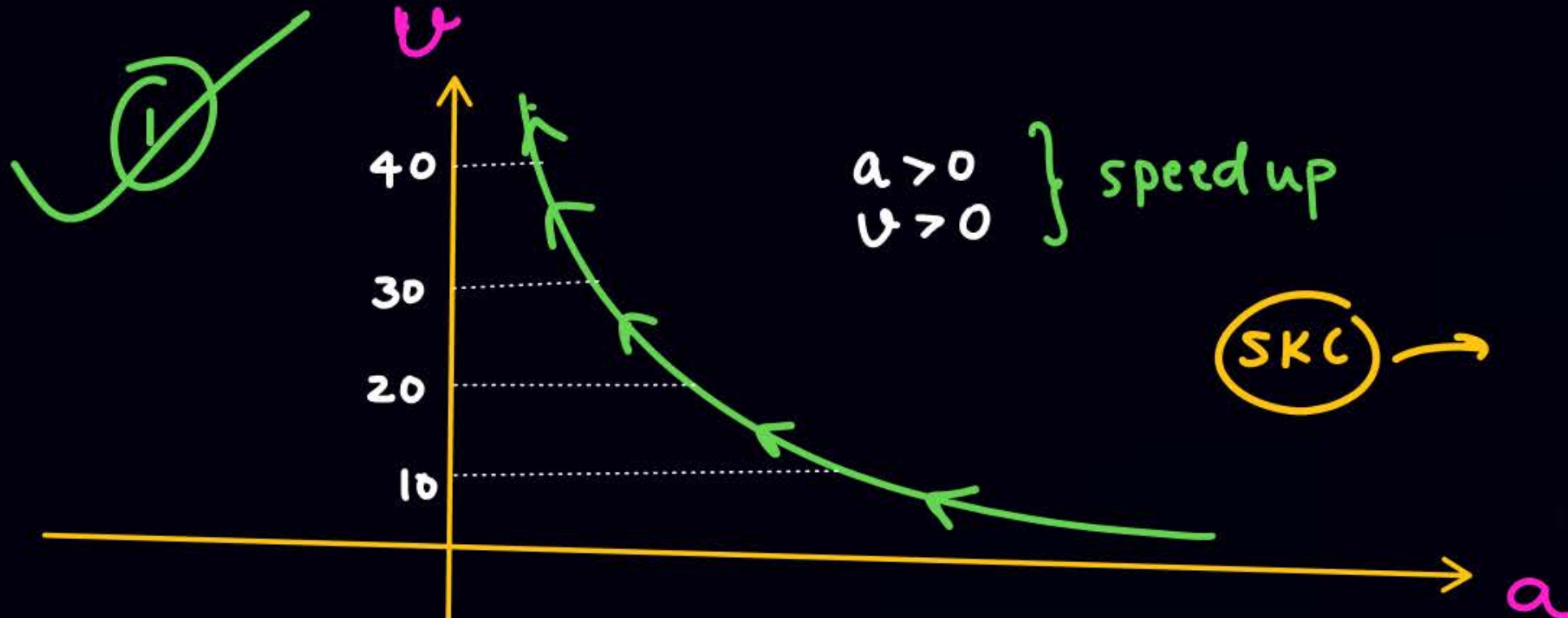


Today's Goal

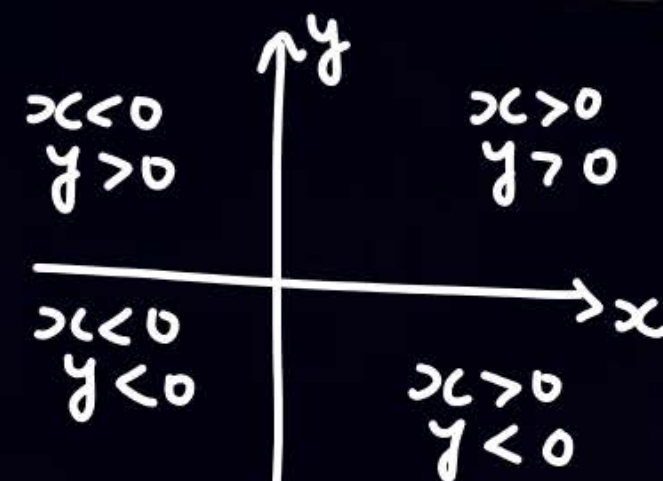
— Play with graph Part02



Q

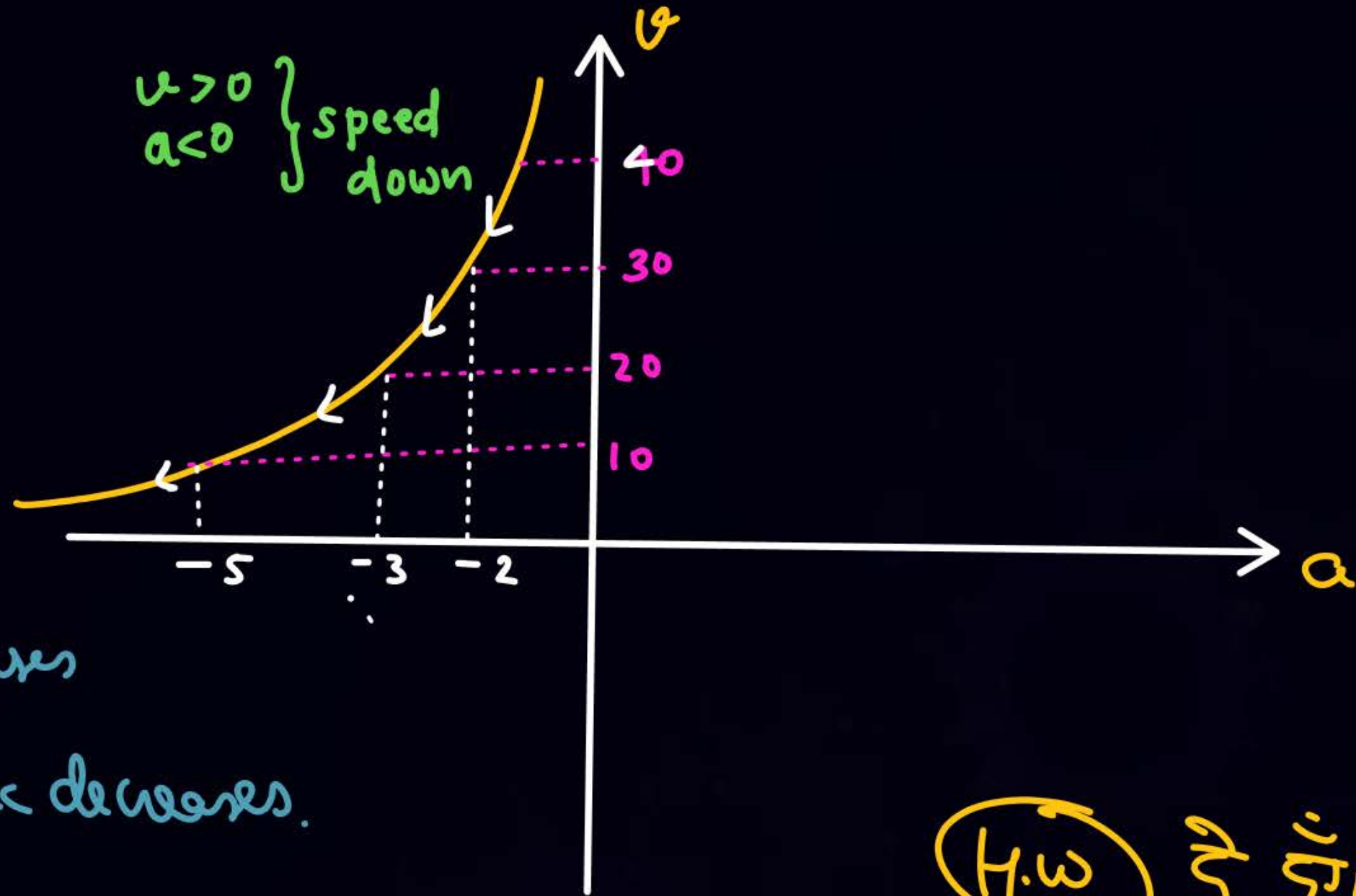


$v$  is increasing  
 $a$  is decreasing.





Q



① speed up

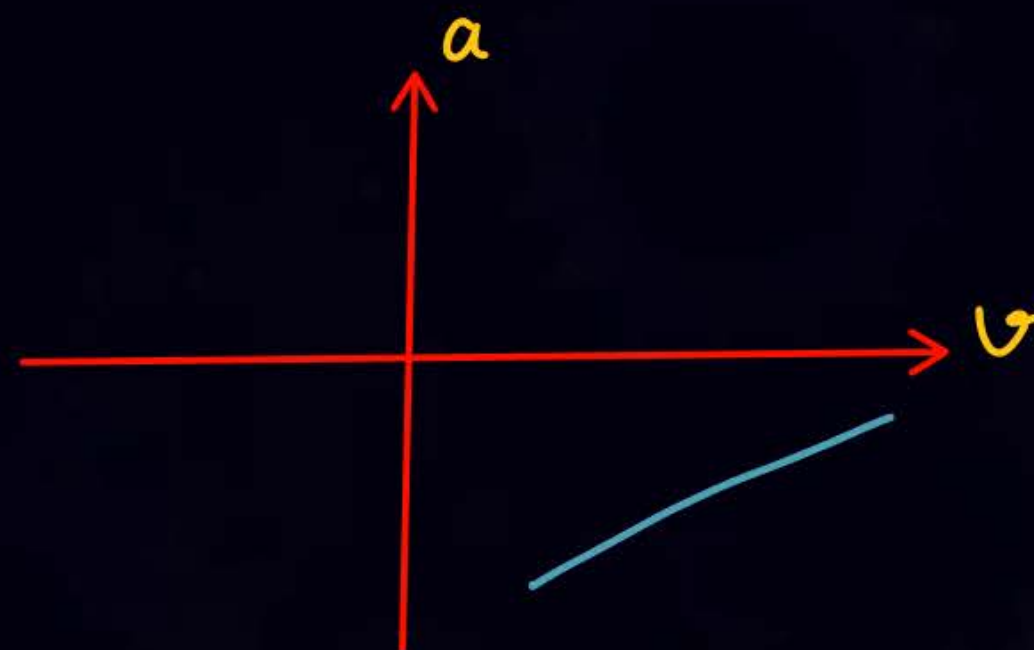
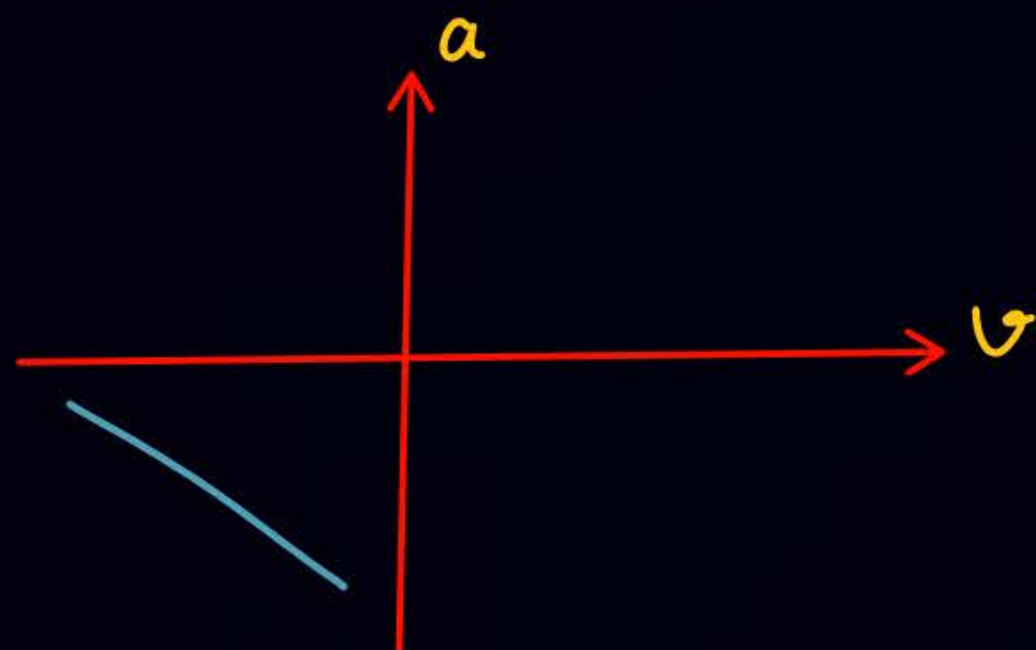
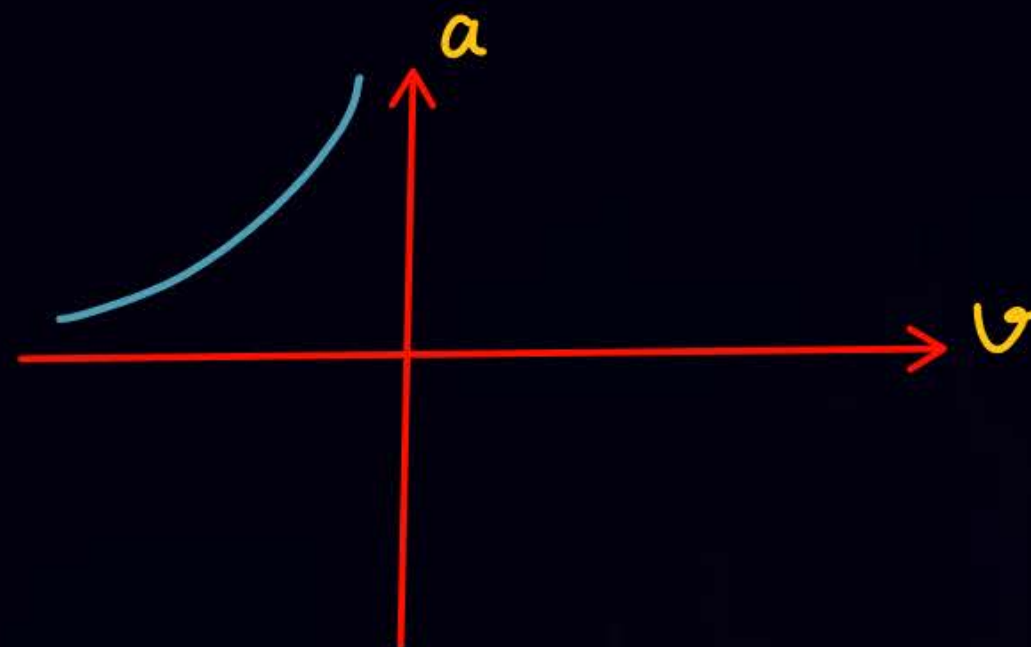
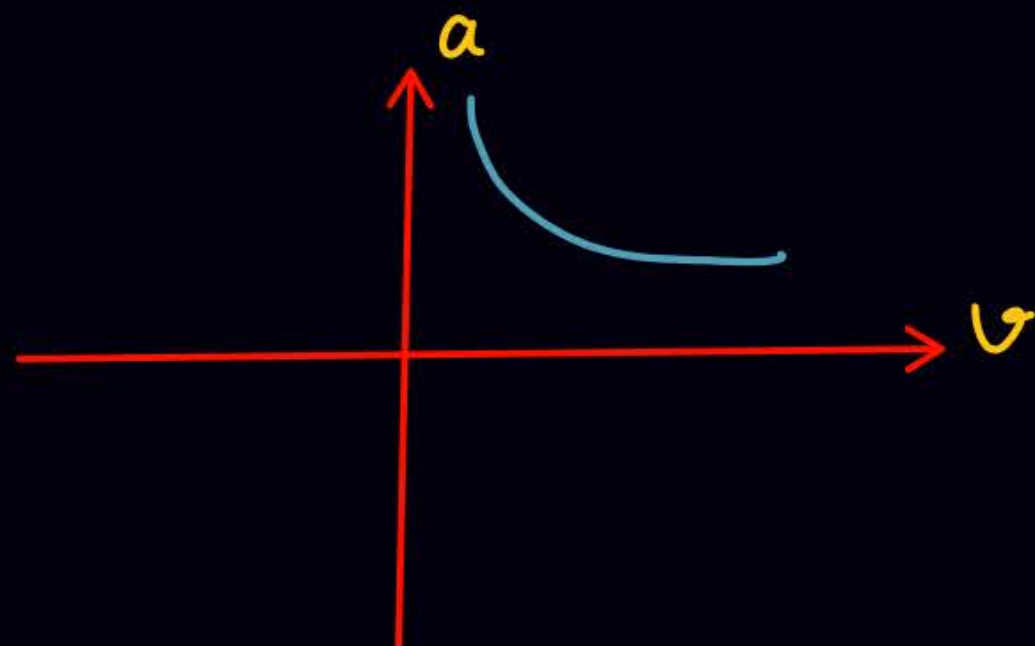
✓ ② speed down

✓ ③ mag. of acc increases

④ magnitude of acc decreases.

H.W है ही॥

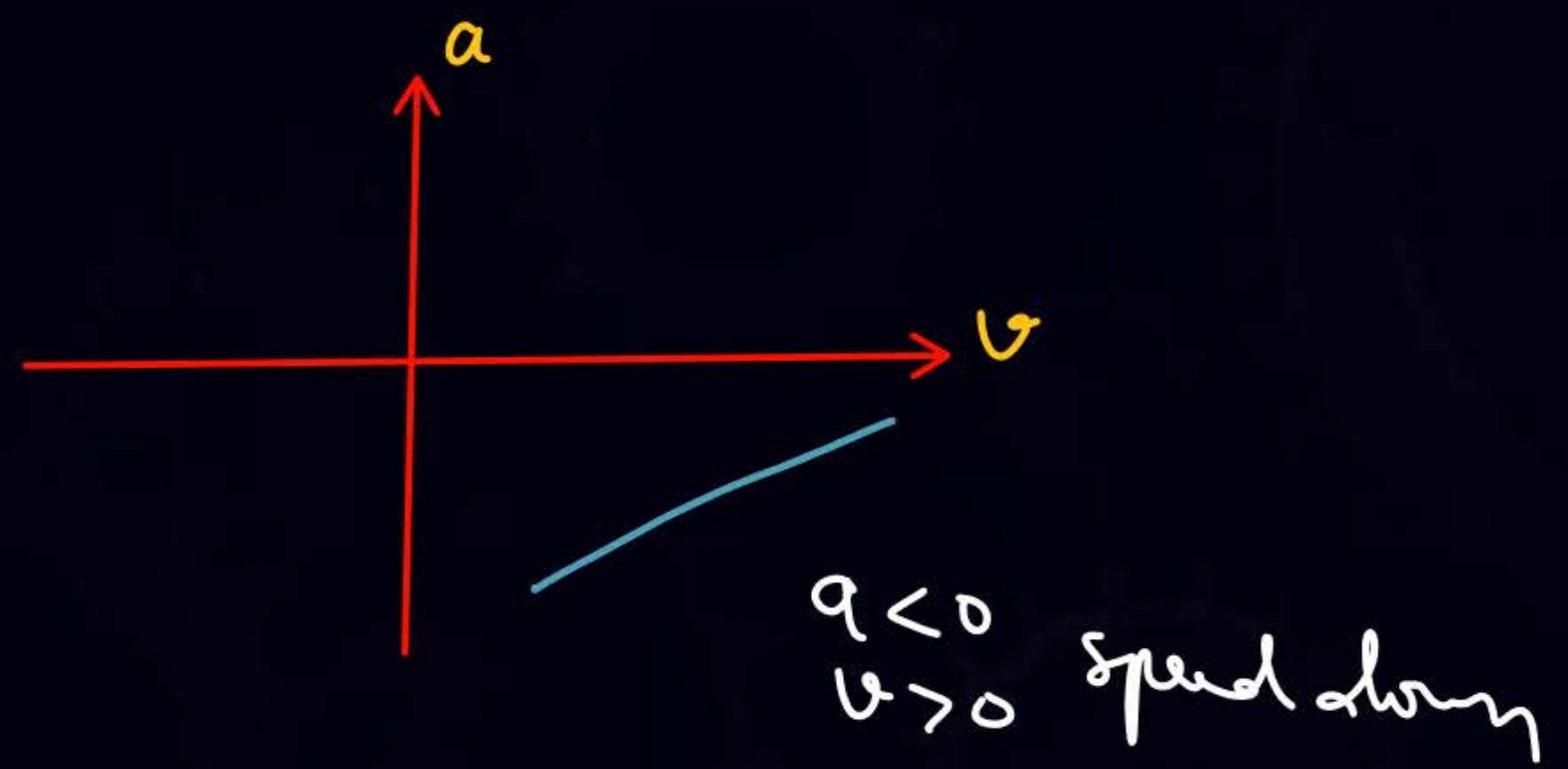
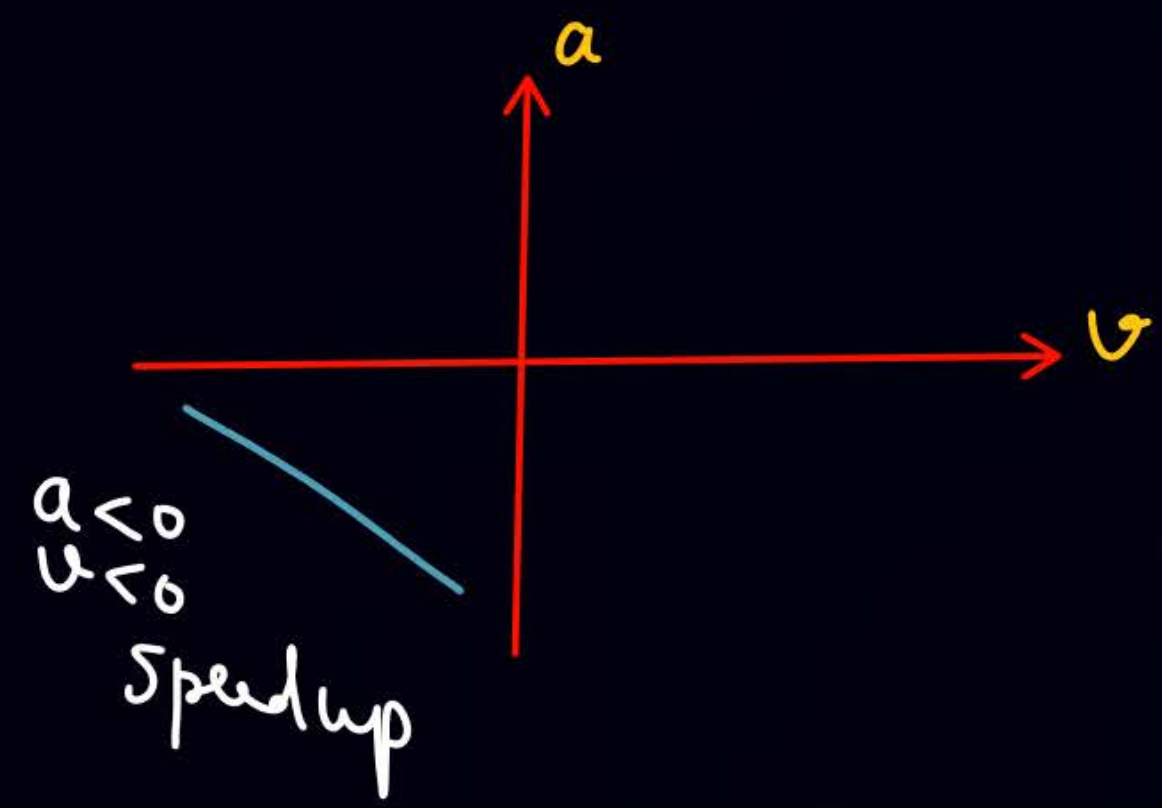
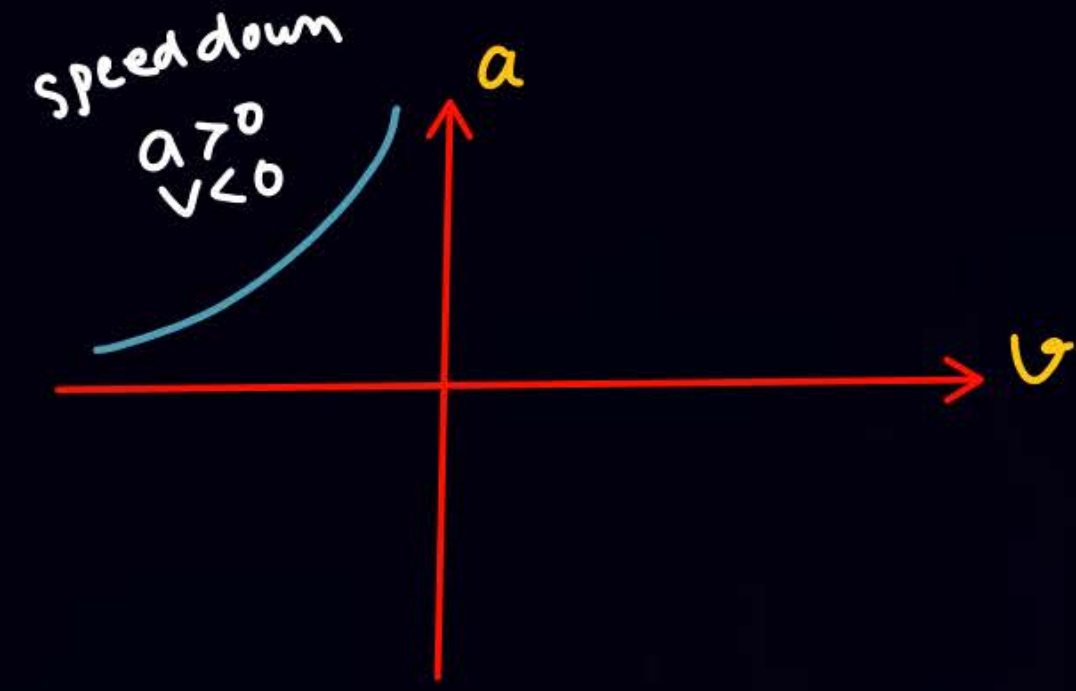
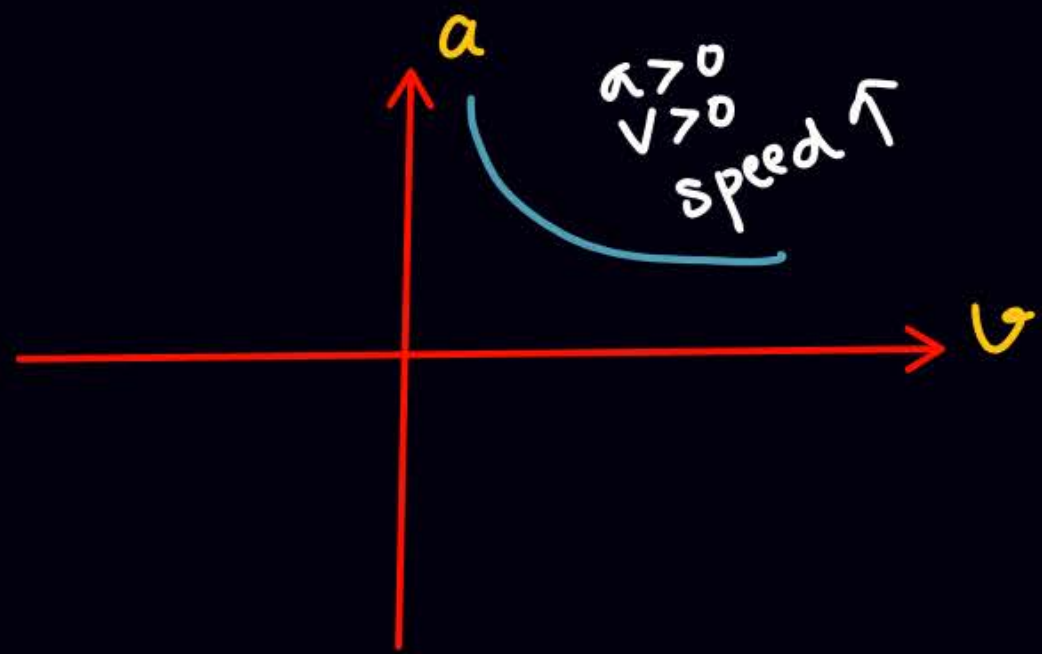
H/w  
Q2



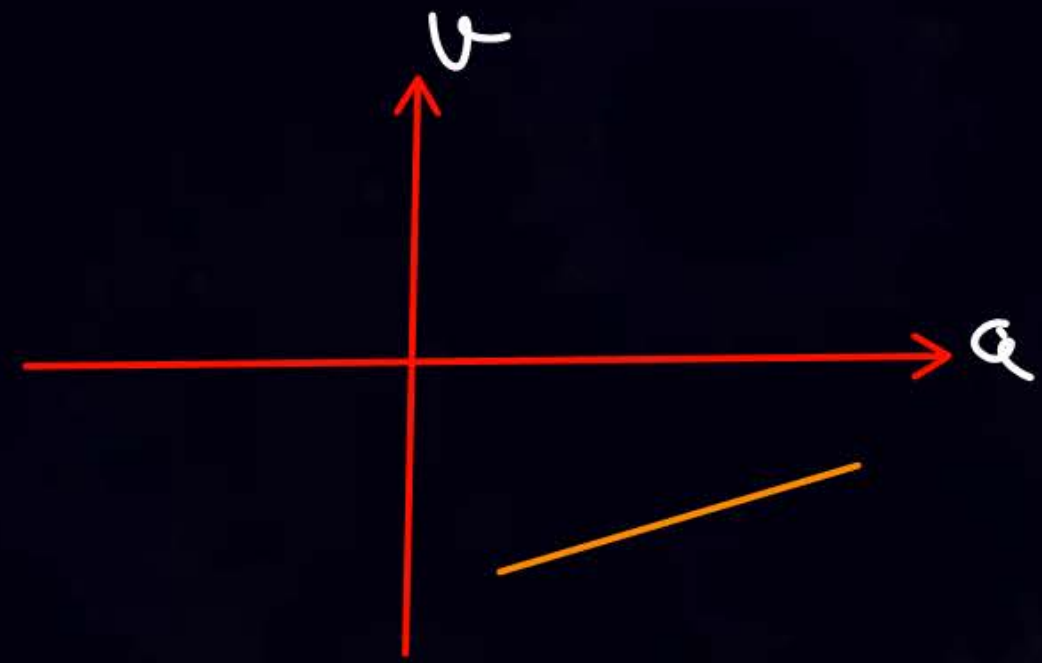
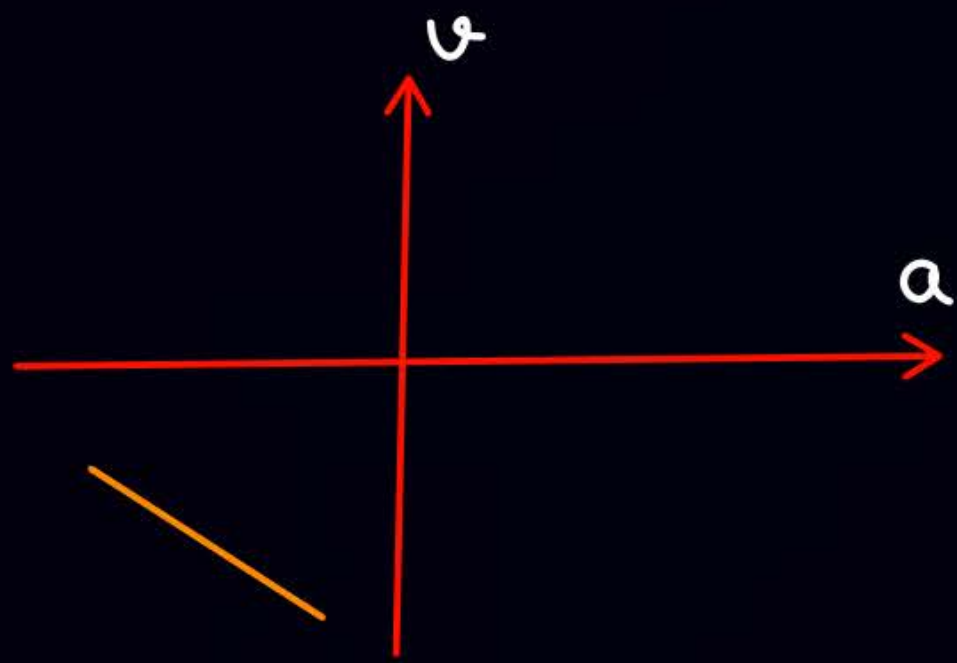
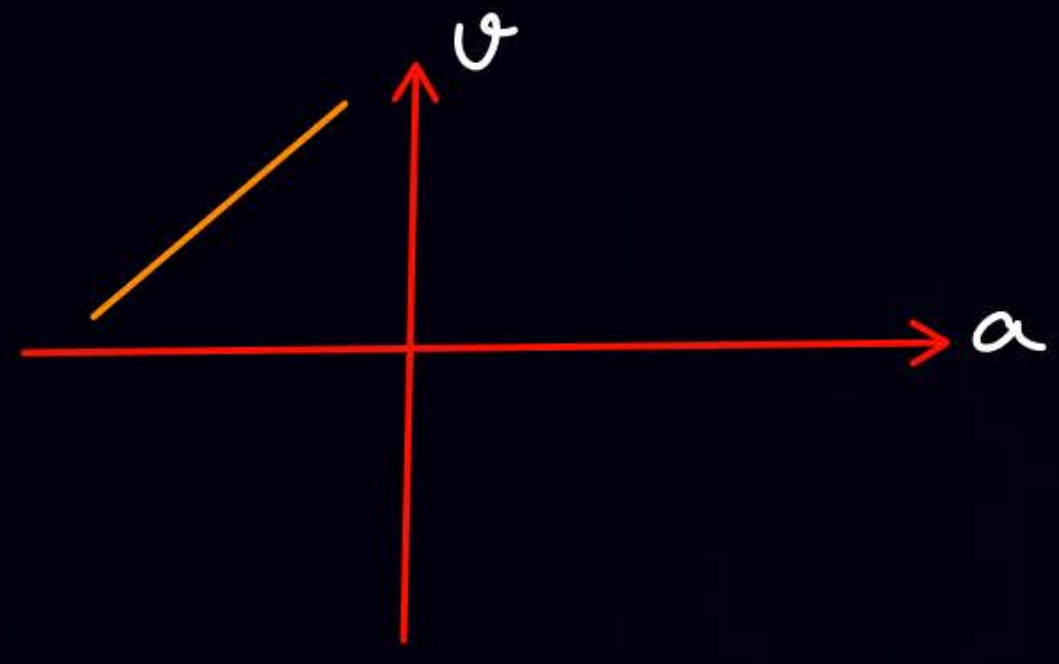
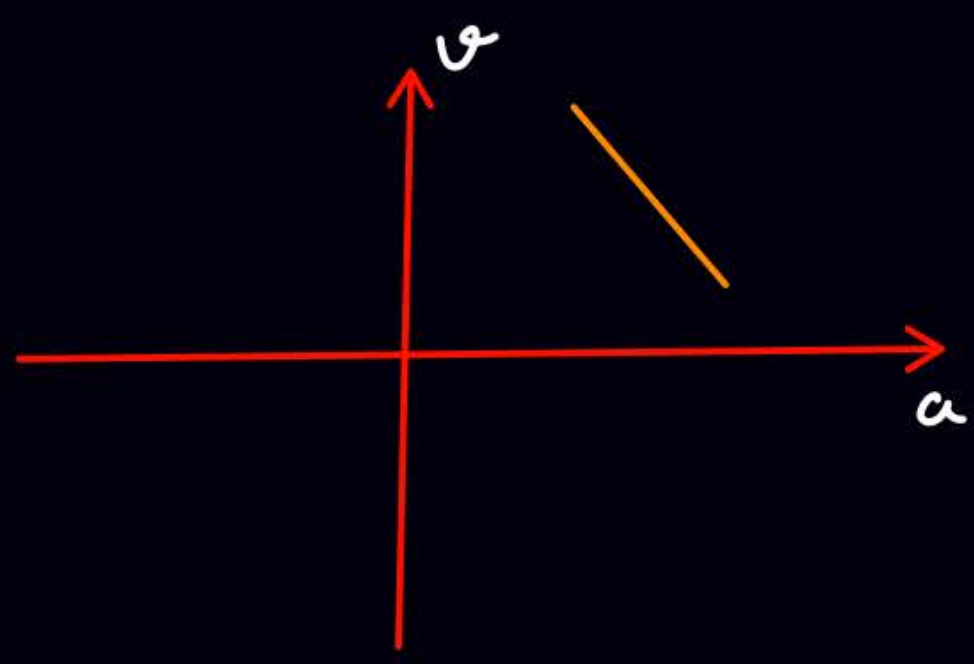


H/W  
Q2

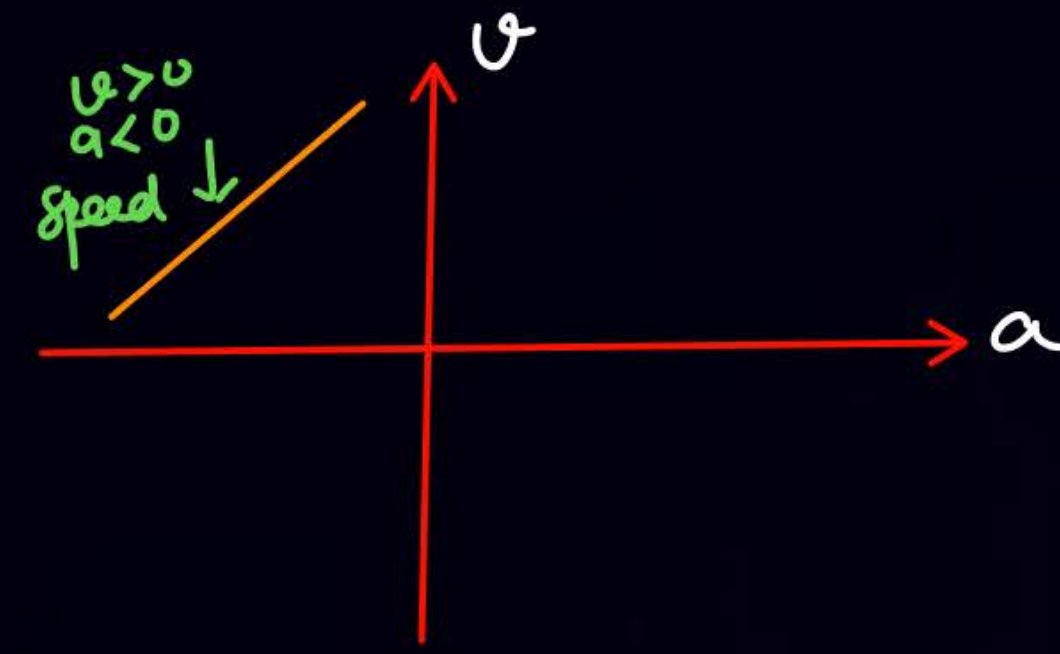
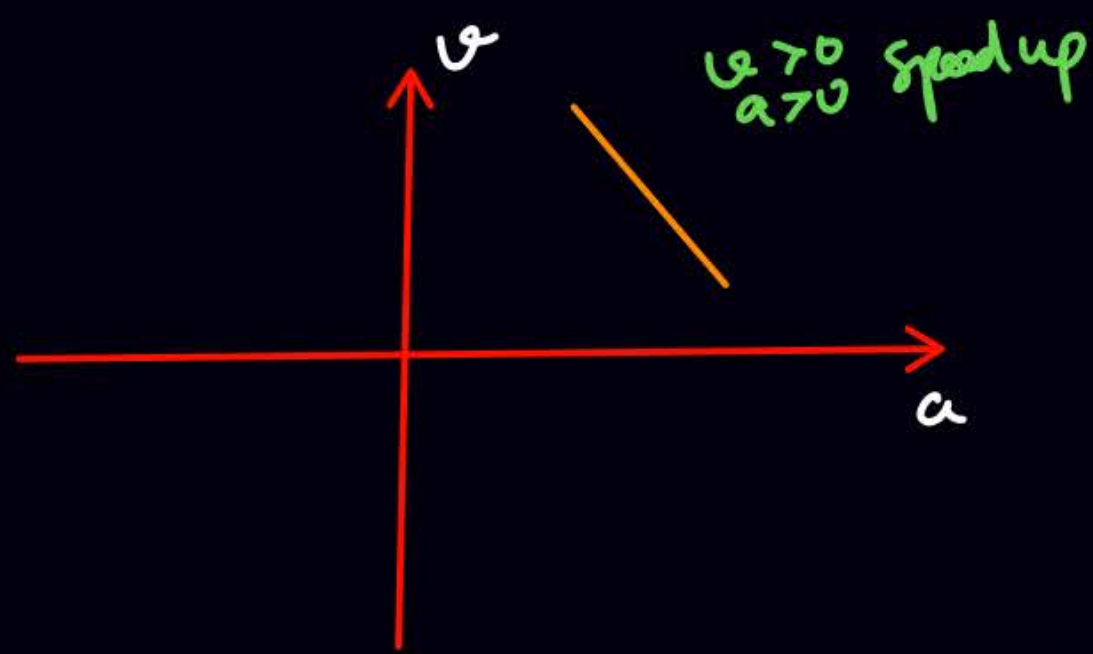
Ans



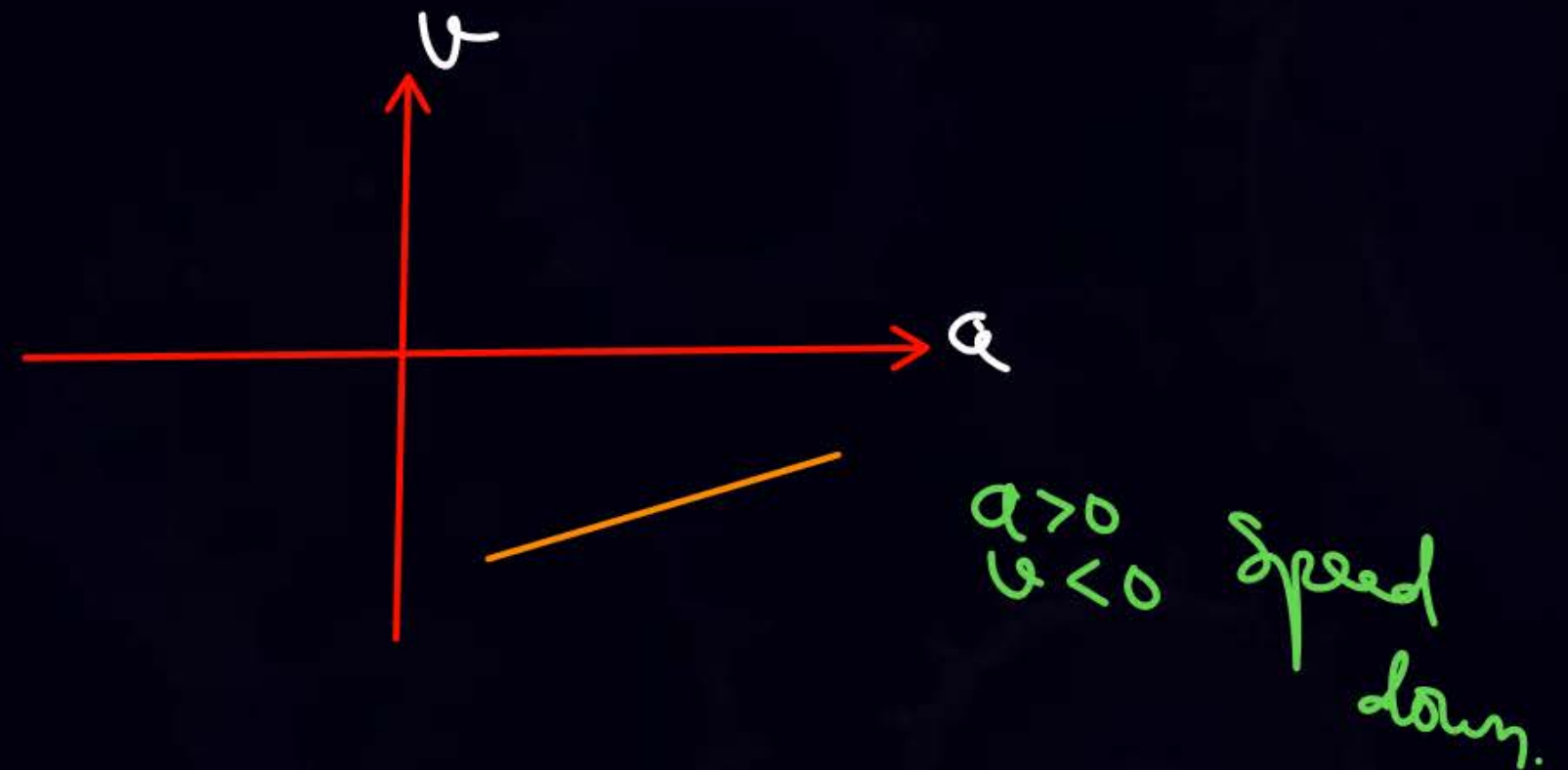
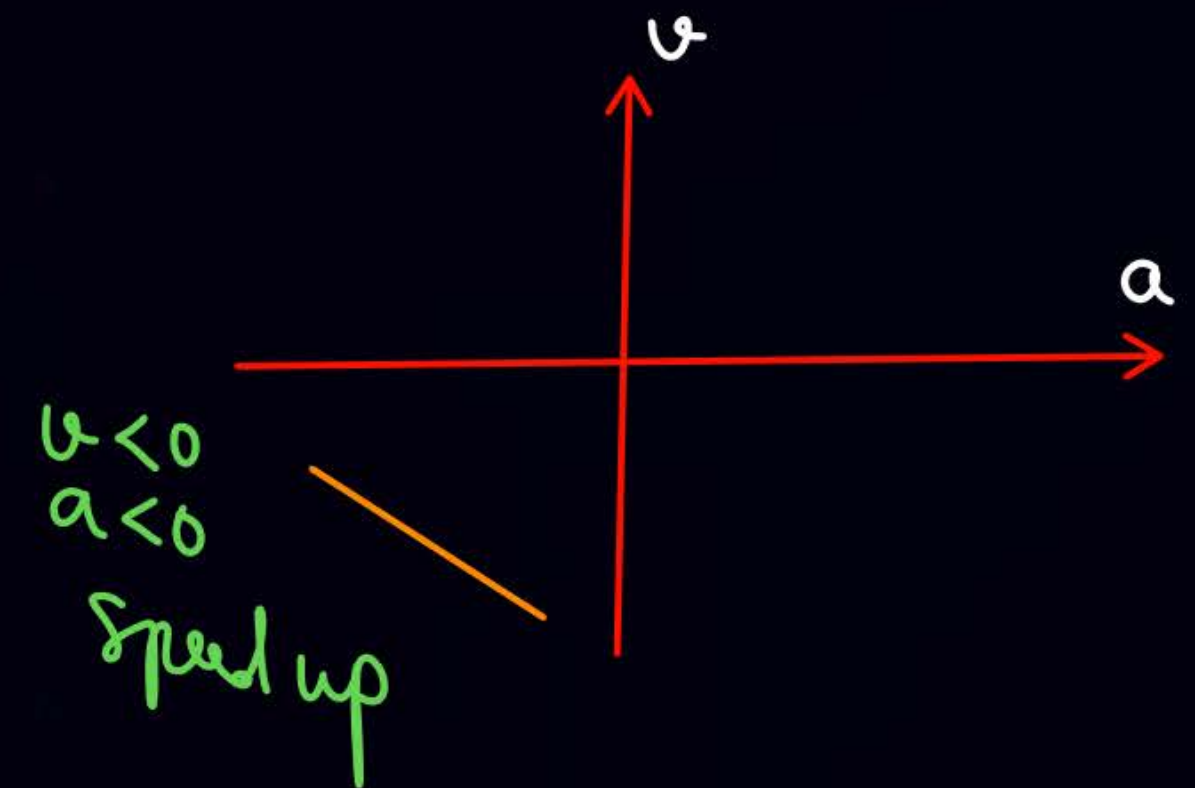
H/W  
Q2



H/W  
Q2



Ans

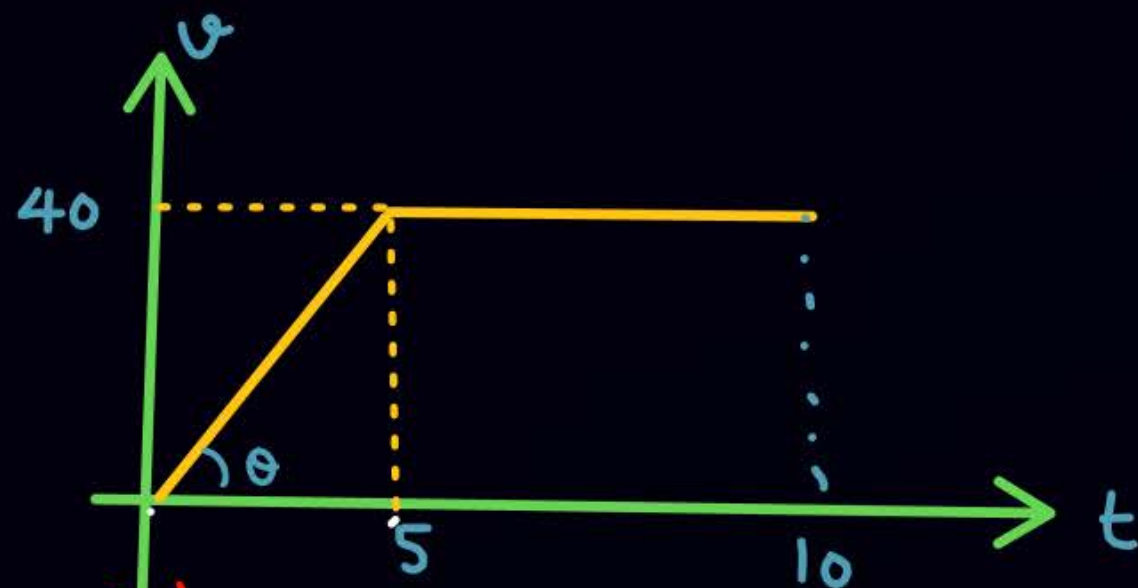




\* If  $a$  is const  $\Rightarrow (v-t)$  st. line  $\Rightarrow (x-t)$  parabola  
 $a > 0$ , happy  
 $a < 0$  sad.

\* (v-t) graph का slope  $\Rightarrow$  acc.

①



(SKC Derivative)

5 sec  $\rightarrow$  40  
1 sec  $\rightarrow$  8 = a

(a) find acc at  $t=4$

$$\text{slope} = \tan \theta = \frac{40}{5} = 8$$

(b) find acc at  $t=9$

$$a = 0$$

From  $t=0 \rightarrow t=5 \Rightarrow a = \text{const}$   
 $a > 0$

$$a = \tan \theta = \frac{40}{5}$$

$t=5 \rightarrow t=9 \Rightarrow a = 0$

✂✂ ghr



①  $(a \rightarrow \text{const})$

$$t = 0 \\ v_i = 0$$

$$t = 10 \\ v_f = 70$$

$$\Rightarrow a = 7$$

②  $(a \rightarrow \text{const})$

$$t = 0 \\ v_i = 10$$

$$t = 10 \\ v_f = 90$$

$$\Rightarrow a = 8$$

③  $(a \rightarrow \text{const})$

$$t = 0 \\ v_i = 0$$

$$t = 10 \\ v_f = -60$$

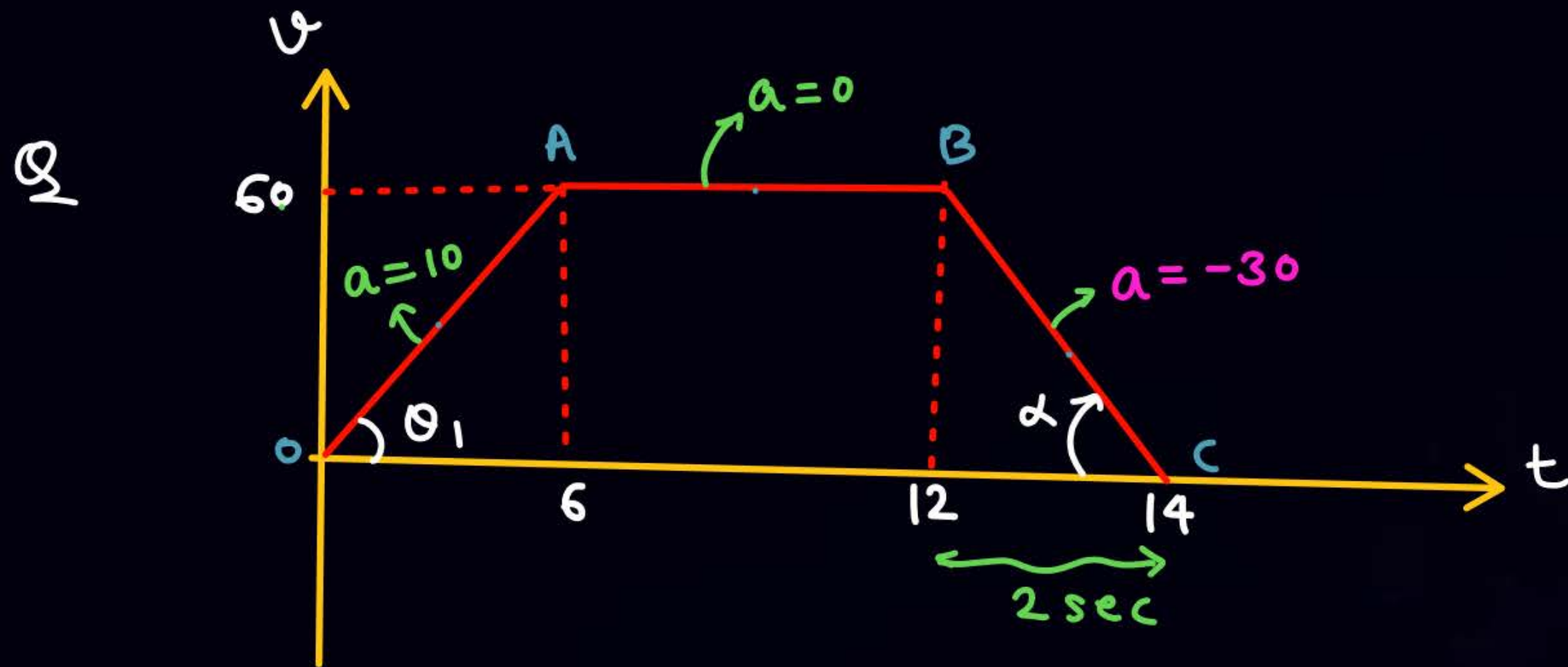
$$\Rightarrow a = -6$$

④  $a(\text{const})$

$$t = 0 \\ v = -20$$

$$t = 10 \\ v = 70$$

$$\Rightarrow a = +9$$



$$\tan \alpha = \frac{60}{2} = 30$$

(B  $\rightarrow$  c)

$$a = -30$$

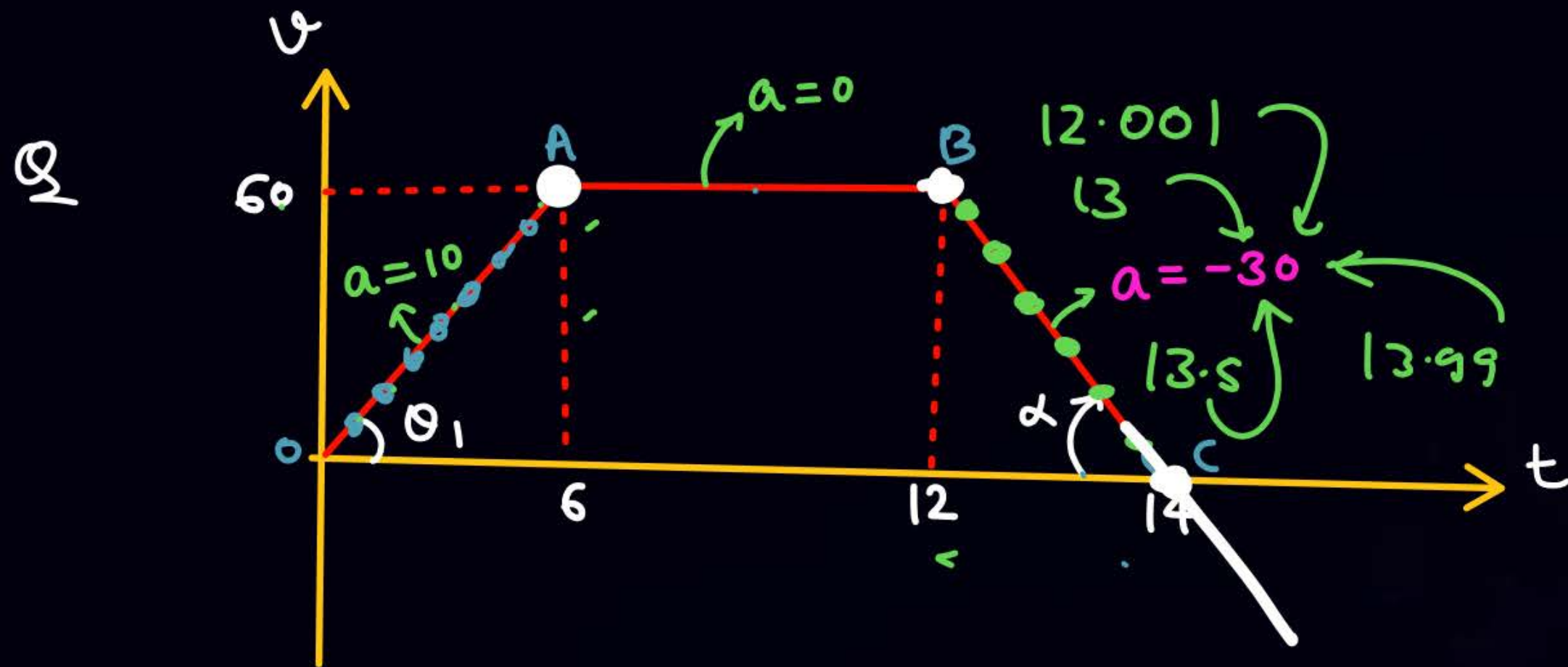
(b  $\rightarrow$  A)  $a = 10$

$$\tan \theta_1 = \frac{60}{6} = 10$$

(A  $\rightarrow$  B)  $a = 0$

(B  $\rightarrow$  c)  $a = -30$



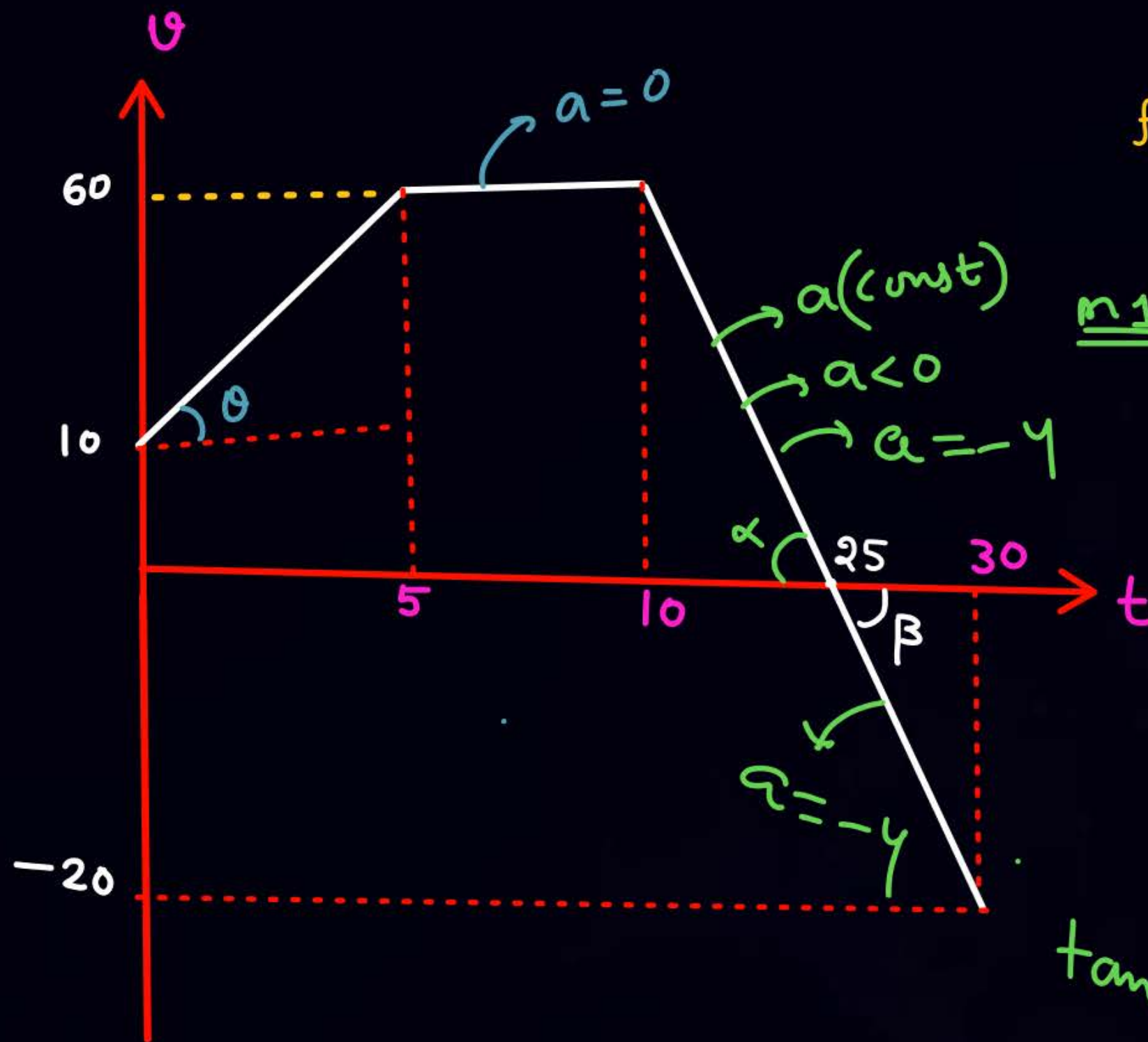


$t=1 \quad a=10$   
 $t=2 \quad a=10$   
 $t=3 \quad a=10$   
 $t=4 \quad a=10$   
 $t=5 \quad a=10$   
 $t=5.5 \quad a=10$

$t=5.999 \quad a=10$

Q

+



find acc at

$t = 3, t = 7, t = 12, t = 25$

m1 (maths)

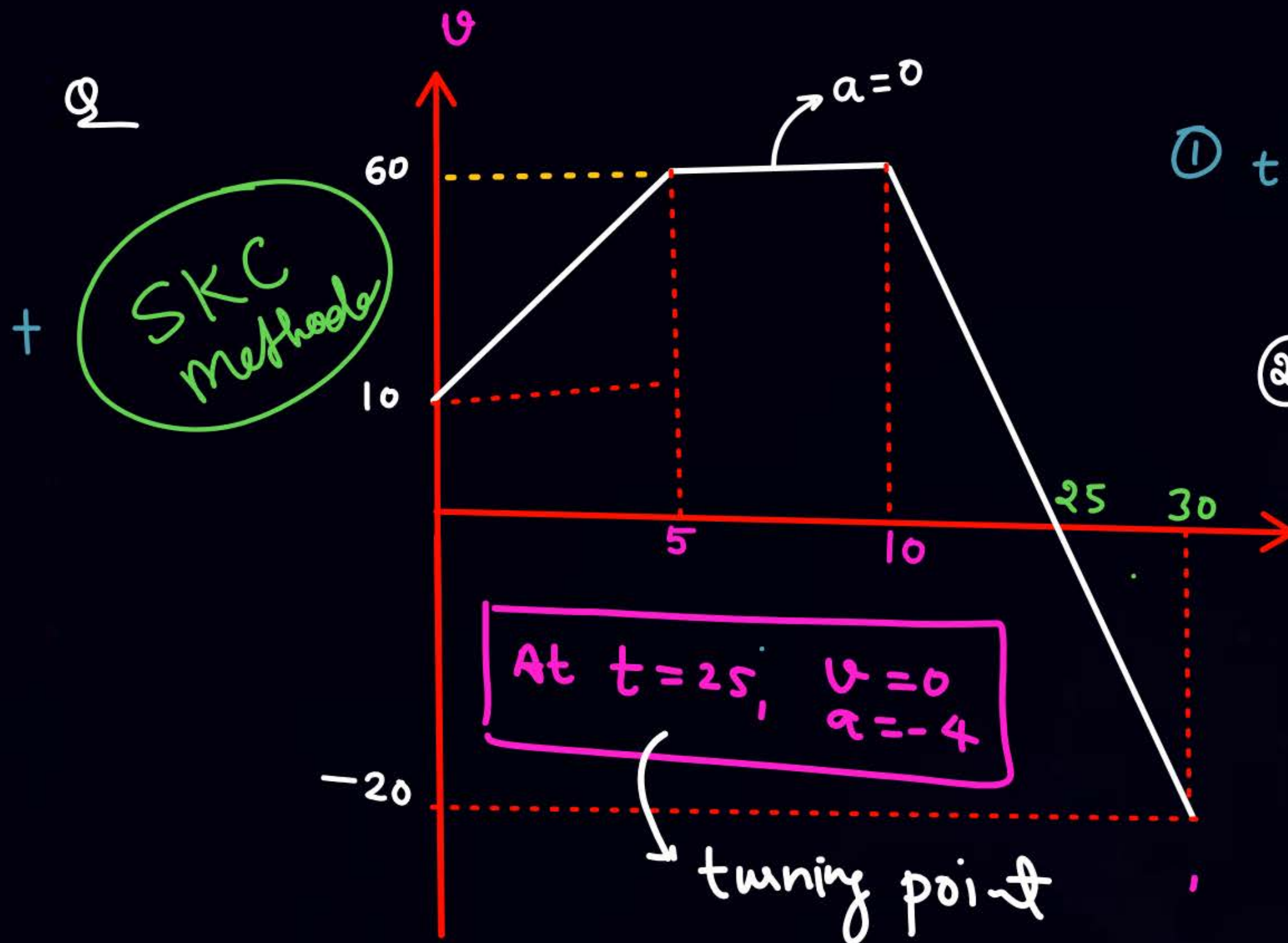
$$\tan \theta = \frac{60 - 10}{5} = 10$$

$$\tan \alpha = \frac{60}{25 - 10} = 4$$

$$t = 10 \rightarrow t = 25$$

$$a = -4$$

$$\tan \beta = \frac{20}{5} = 4$$



①  $t = 0 \longrightarrow t = 5$

$a = +10$

②  $t = 10 \longrightarrow t = 25$

$a = -4$

③  $t = 25 \longrightarrow t = 30$

$a = -4$

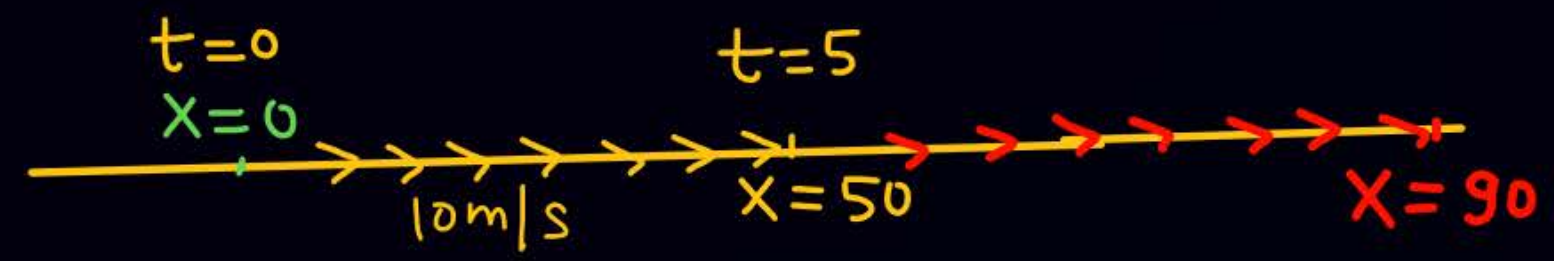




Q  
gives

A particle start moving from origin ( $x=0$ ) along the  $+x$ -Axis.  
In first five second it travel with const velocity  $10\text{m/s}$  and after five sec it travel with  $+20\text{m/s}$  const velocity for two sec along  $+x$  Axis.  
find Displacement & distance travel by particle in entire journey.

Soln



$S_1 = \text{speed} \times \text{time}$

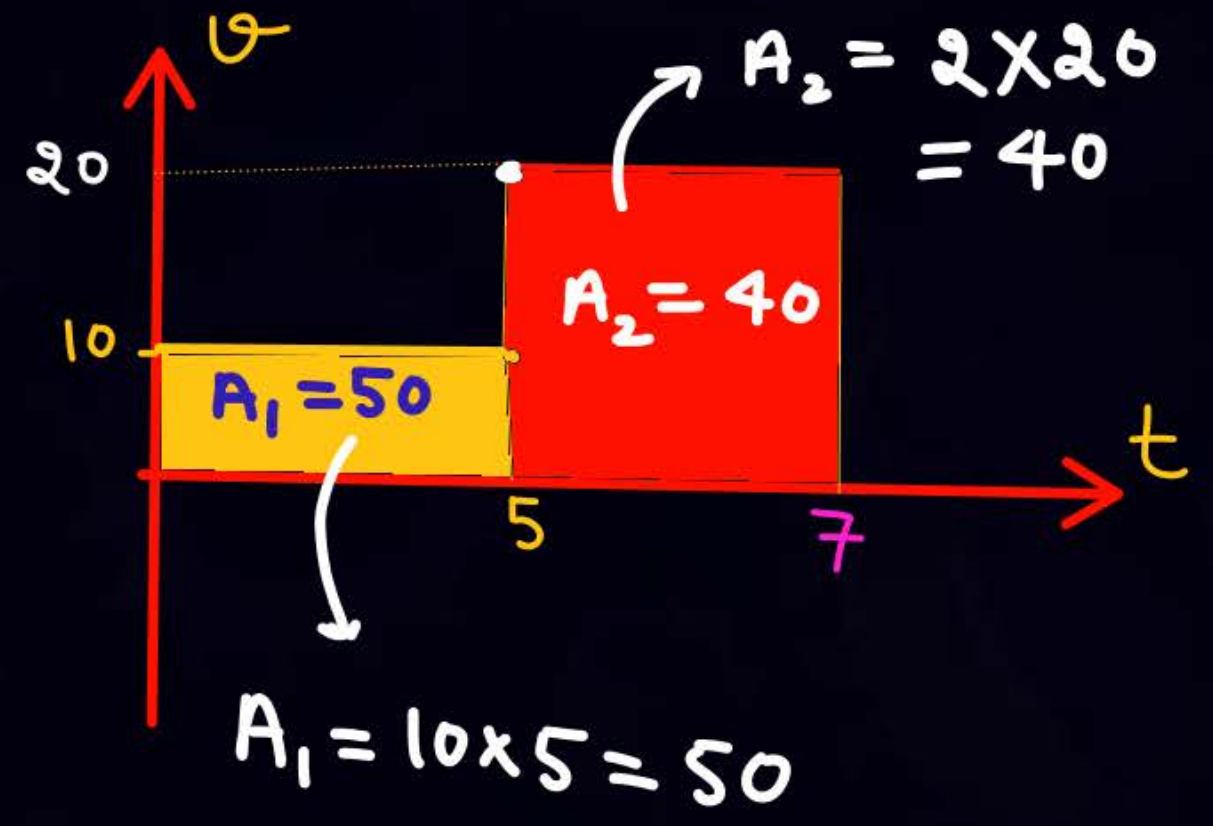
$$S_1 = 10 \times 5 = 50\text{m}$$

$$S_2 = 20 \times 2 = 40\text{m}$$

$$\text{Distance} = 90\text{m}$$

$$\text{displacement} = 90\text{m}$$

$$\begin{aligned} A_{\text{net}} &= A_1 + A_2 \\ &= 50 + 40 \\ &= 90 \end{aligned}$$



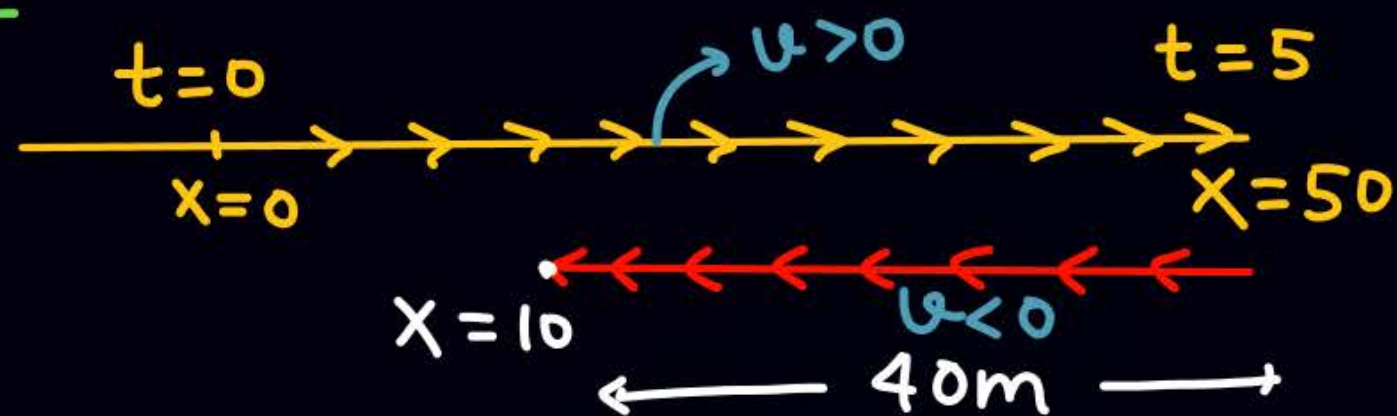




Q  
ghr

Particle start motion from origin with const velocity  $+10\text{m/s}$  for five sec. After five sec it reversed its direction and travel with const velocity  $20\text{m/s}$  along  $-x$ -Axis for two sec. find distance & displacement.

sol<sup>n</sup>



$$S_1 = v_1 t = 10 \times 5 = 50$$

$$S_2 = \text{Distance} = v_2 \times t$$

$$= 20 \times 2 = 40 \text{ (Peeche)}$$

$$\text{Distance} = 50 + 40 = 90$$

$$\text{displacement} = 50 - 40 = 10$$

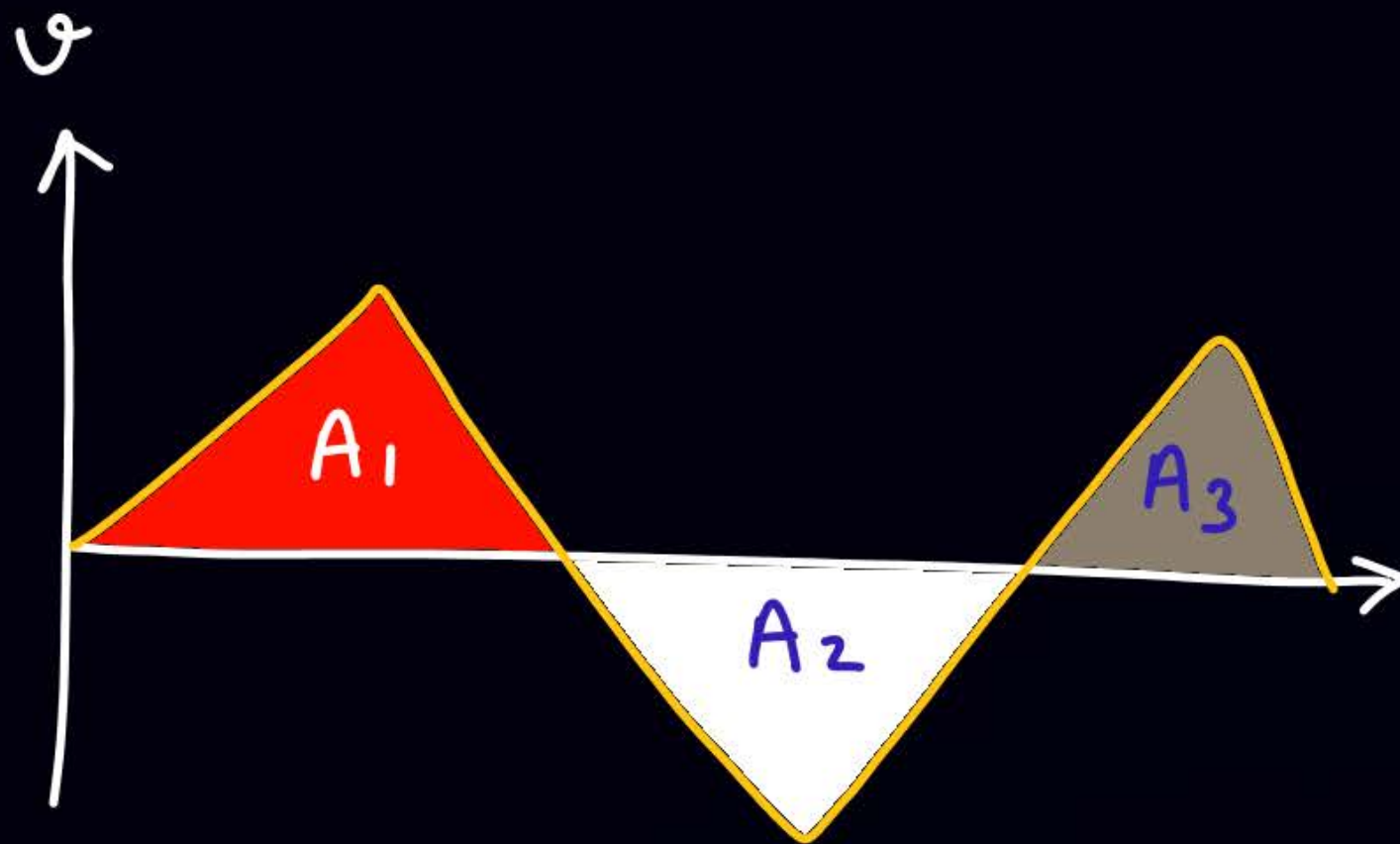
$$A_1 = 10 \times 5 = 50 \text{ (Upper)}$$

$$A_2 = 20 \times 2 = 40 \text{ (Neeche)}$$

$$\text{Distance} = 50 + 40 = 90$$

$$\text{Displacement} = 50 - 40 = 10$$

#



(v-t) graph का Area



$$\text{Displacement} = A_1 - A_2 + A_3 = A_{\text{ऊपर}} - A_{\text{नीचे}}$$

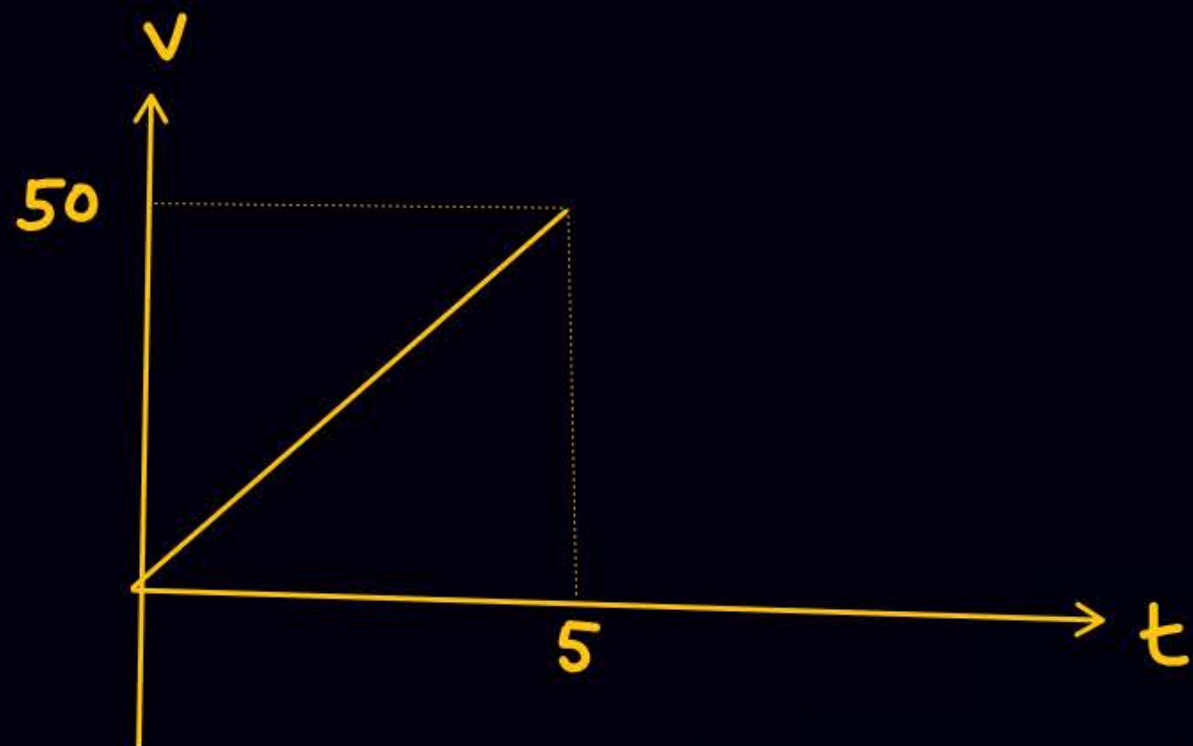
$$\text{Distance} = A_1 + A_2 + A_3 = A_{\text{ऊपर}} + A_{\text{नीचे}}$$

$$\langle \text{Velocity} \rangle = \frac{A_1 - A_2 + A_3}{\text{time}}$$

$$\langle \text{Speed} \rangle = \frac{A_1 + A_2 + A_3}{\text{time}}$$

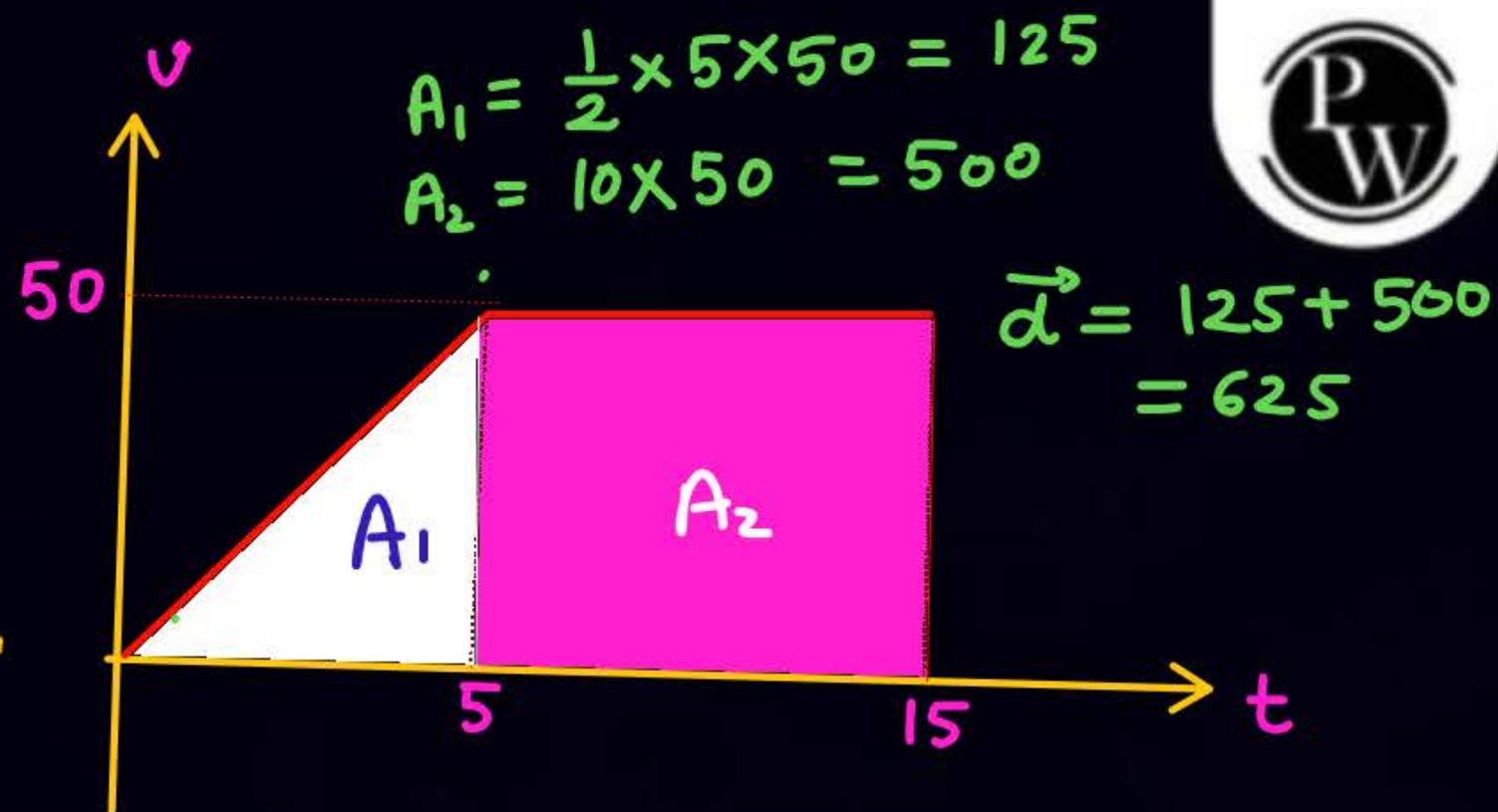


①


 $t=0 \longrightarrow t=5$ 

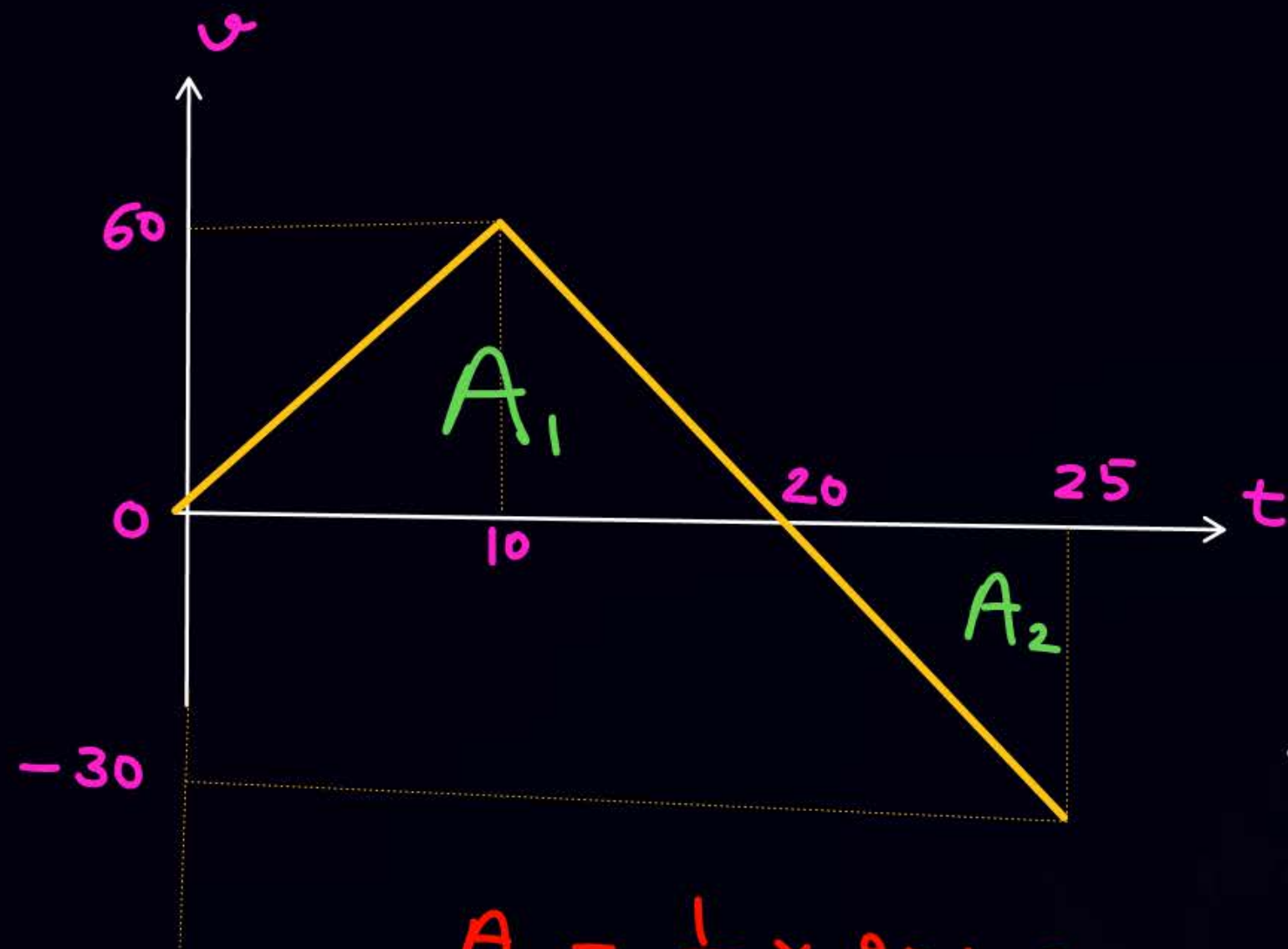
$$\text{Displacement} = \text{Area} = \frac{1}{2} \times 5 \times 50 = 125$$

②



$$\begin{aligned} (t=0 \longrightarrow t=15) \text{ Displacement} &= \text{Area of trapezium} \\ &= \frac{1}{2} (15 + 5) \times 50 = 625 \end{aligned} \quad \left. \vphantom{\begin{aligned} (t=0 \longrightarrow t=15) \text{ Displacement} } \right\} \text{Direct}$$

③



$$A_1 = \frac{1}{2} \times 20 \times 60 = 600$$

$$A_2 = \frac{1}{2} \times 5 \times 30 = 75$$

$$t=0 \longrightarrow t=25$$

$$\text{Displacement} = A_1 - A_2 = 600 - 75 = 525$$

$$\text{Distance} = A_1 + A_2 = 600 + 75 = 675$$

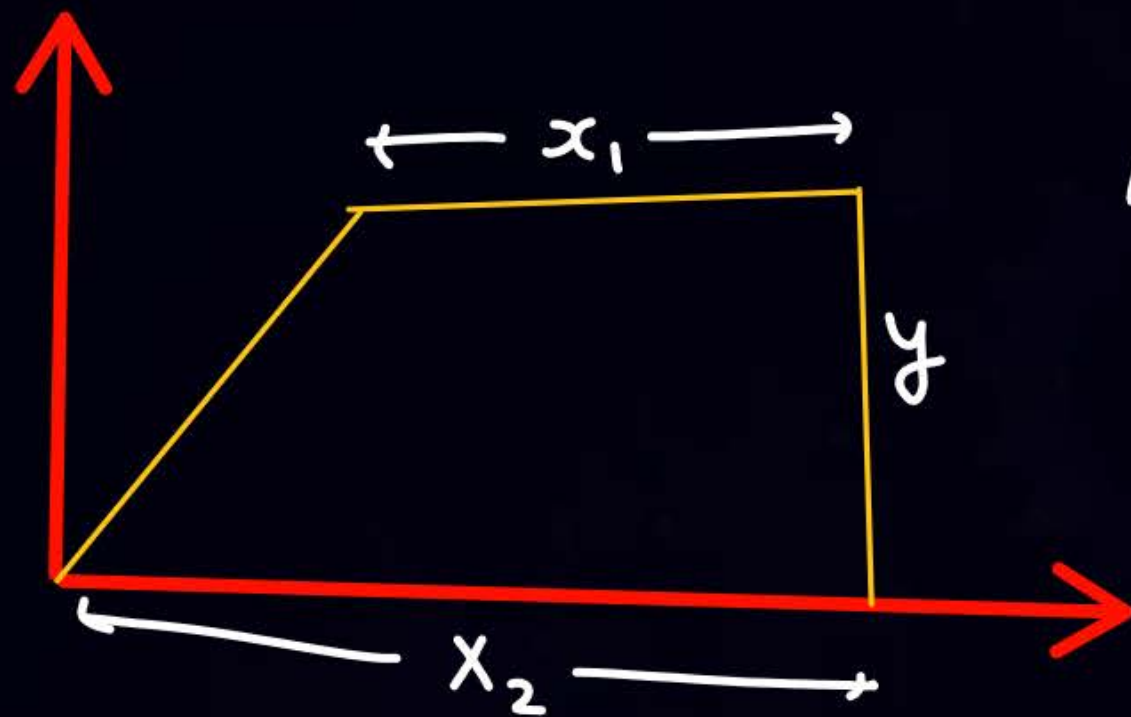
$$\text{Avg velocity} = \frac{525}{25}$$

$$\text{Avg speed} = \frac{675}{25}$$

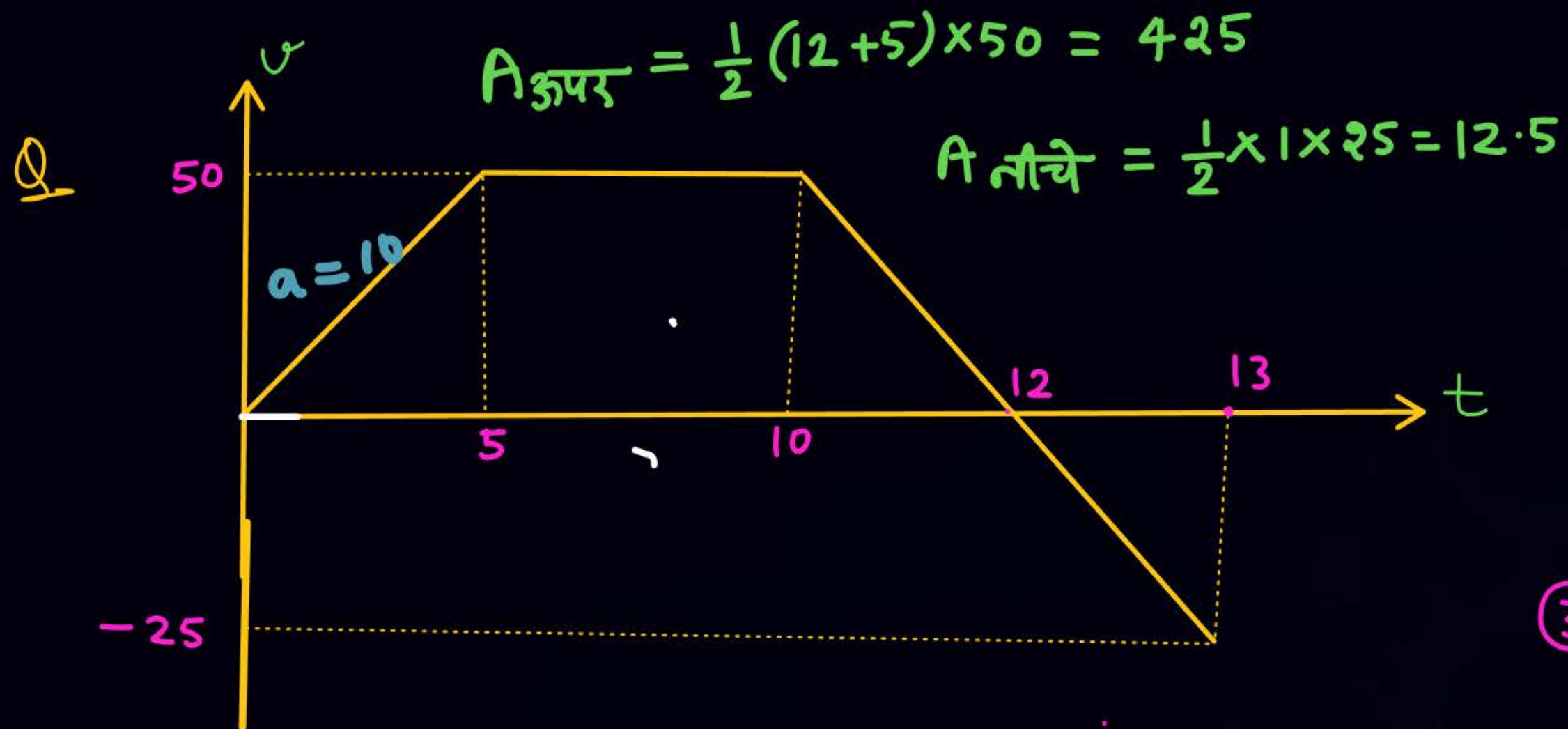




Area of trapezium =  $\frac{1}{2}$  (sum of parallel side)  $\times$  (shortest perpendicular distance)



$$\text{Area} = \frac{1}{2}(x_1 + x_2) y$$



②  $t=0 \longrightarrow t=5$   
 $a=10$

③  $t=5 \longrightarrow t=10$   
 $a=0$

④  $t=10 \longrightarrow t=13$   
 $a=-25$

①  $t=0 \longrightarrow t=13$

Displacement =  $425 - 12.5 = 412.5$

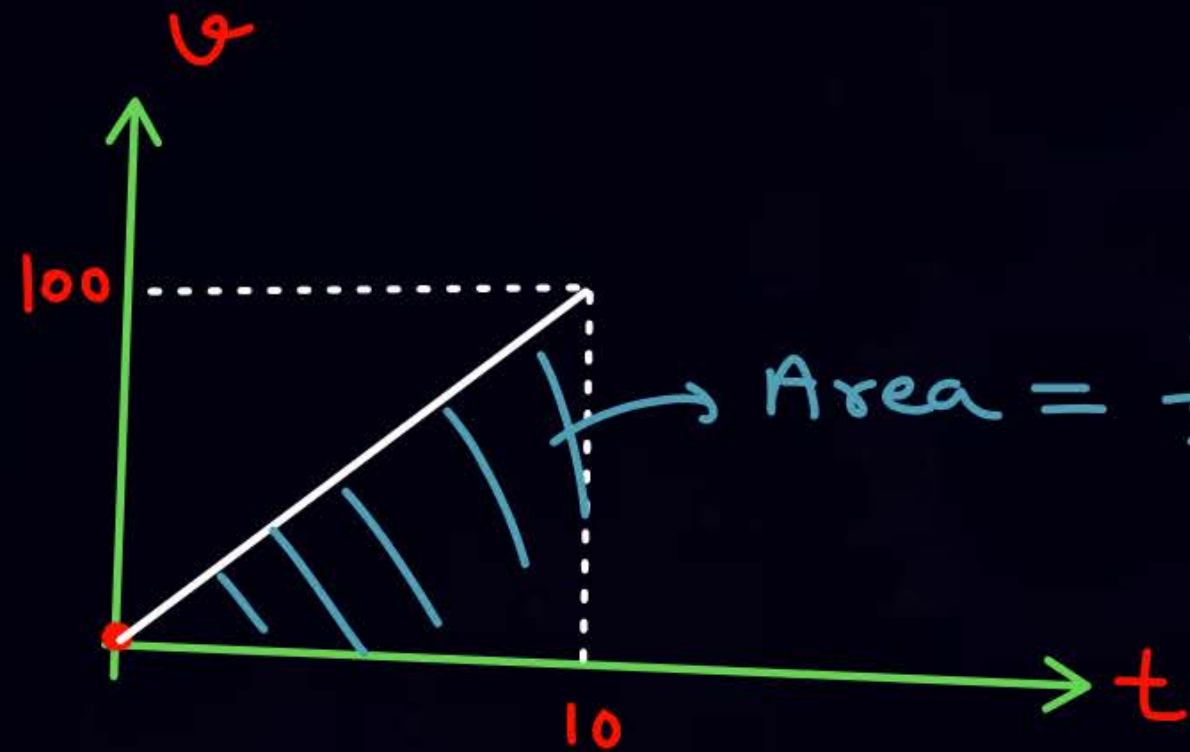
Distance =  $425 + 12.5 = 437.5$

Q A particle start motion from origin from rest having  
const acc  $a = +10 \text{ m/s}^2$ . find  
displacement,  $v$  at  $t = 10 \text{ sec}$ .

Sol<sup>n</sup>

$$u_i = 0$$

$$a = \text{const}$$

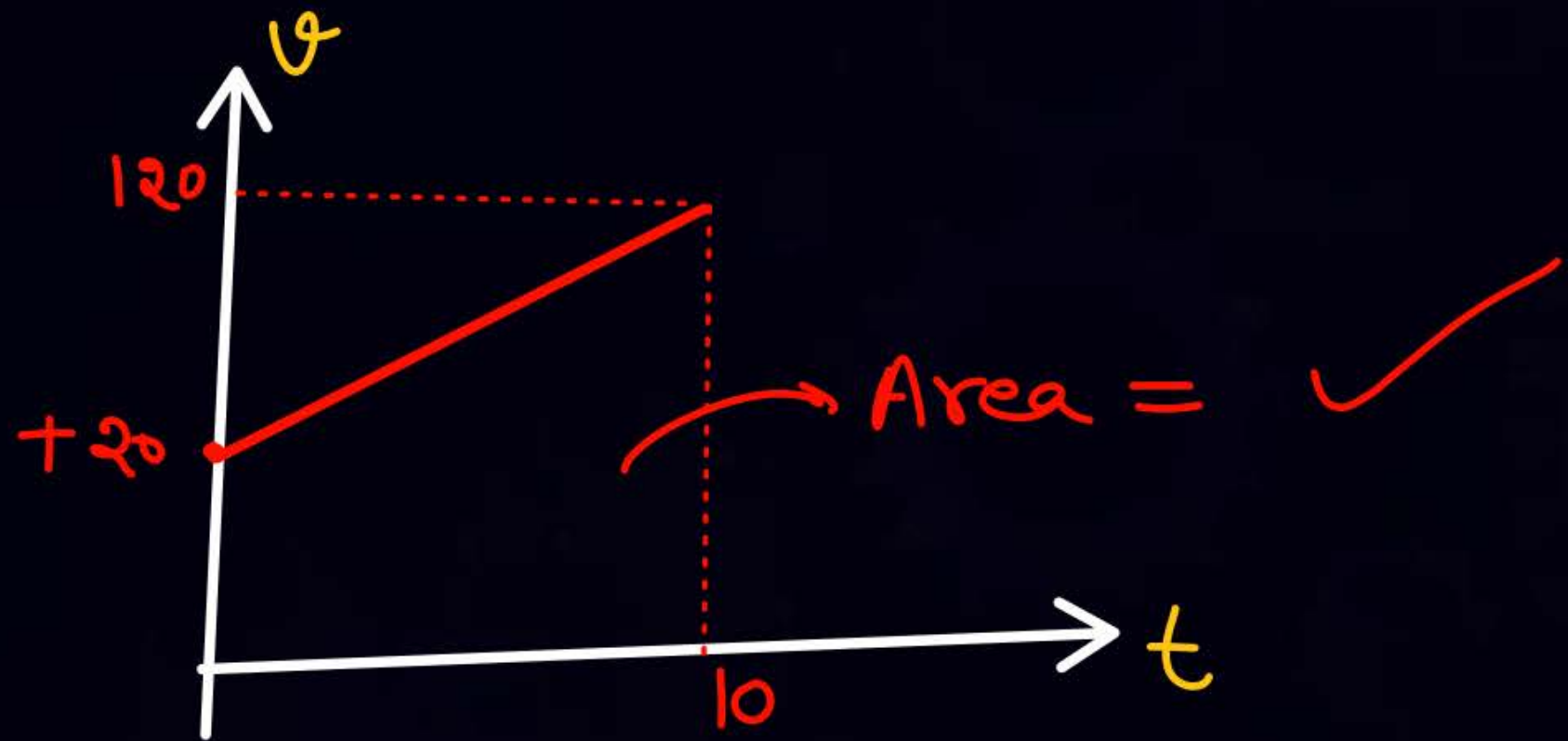


$$\text{Area} = \frac{1}{2} \times 10 \times 100 = 500$$



Q A particle start motion from origin with initial velocity  $+20\text{ m/s}$   
const acc  $a = +10\text{ m/s}^2$  find  
 displacement,  $v$  at  $t = 10\text{ sec}$ .

Sol<sup>n</sup>

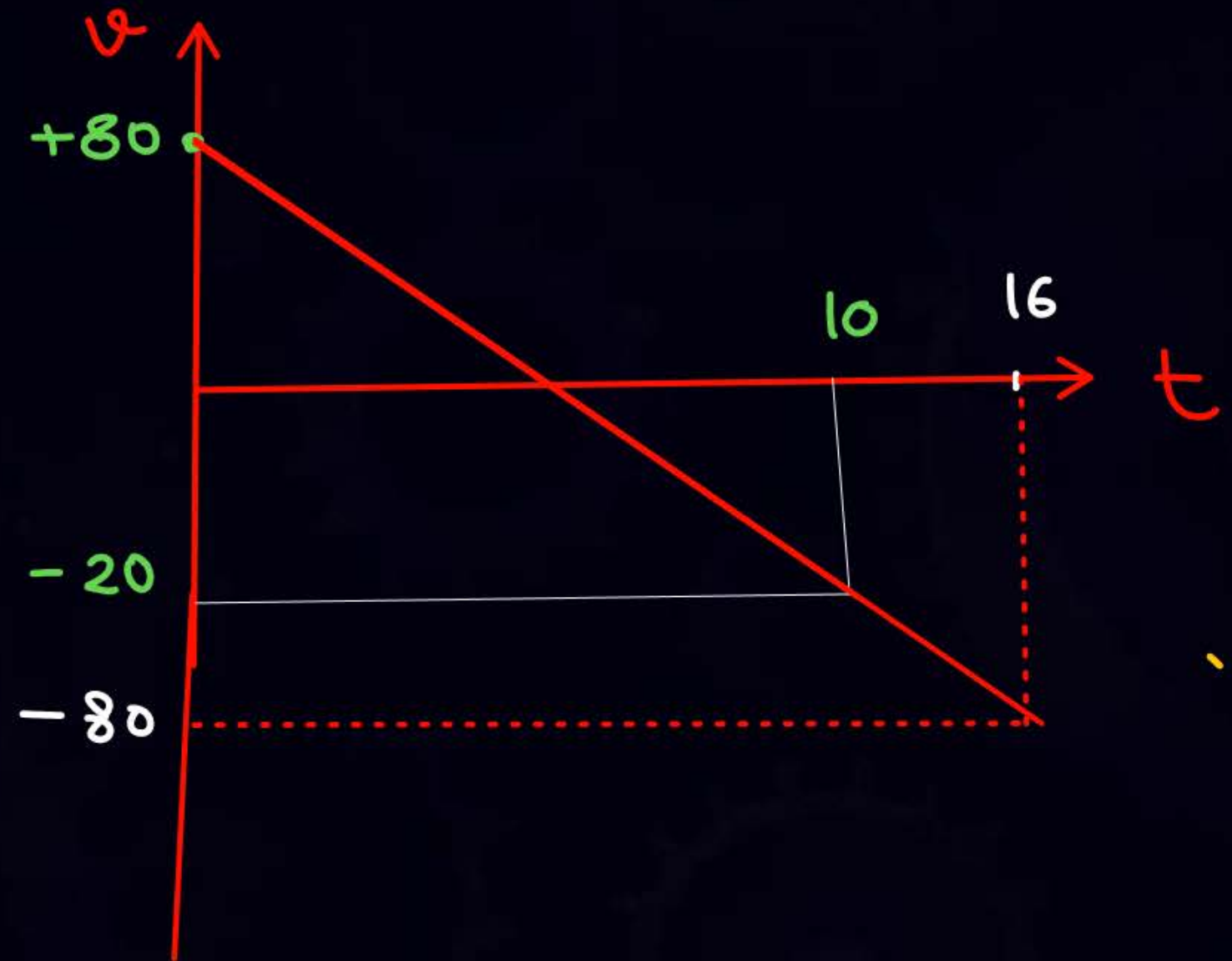
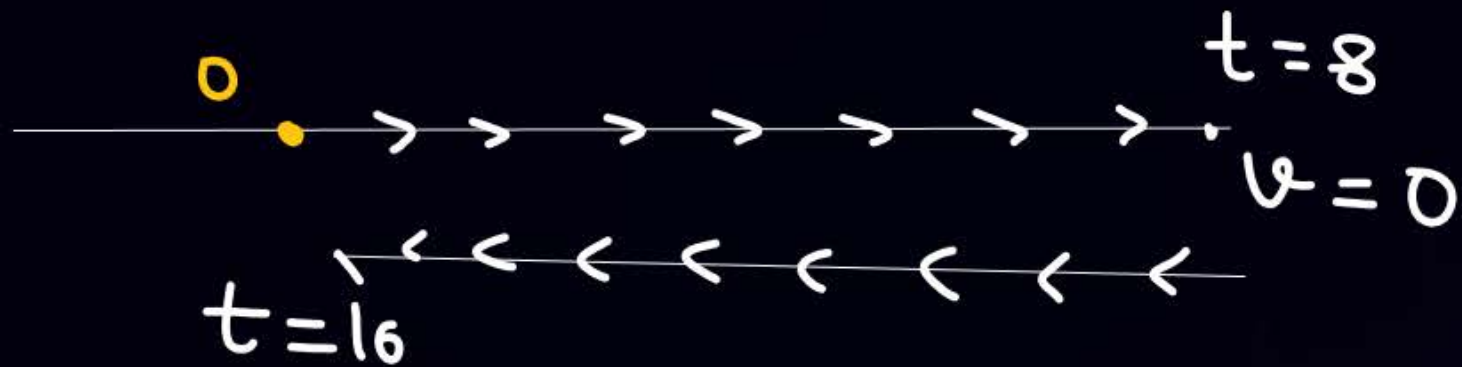






Q A particle start motion from origin with initial velocity  $+80\text{ m/s}$   
Const acc  $a = -10\text{ m/s}^2$ . find  
displacement,  $v$  at  $t = 10\text{ sec}$ .

Sol<sup>n</sup>





## Integration

\*

$$v = \frac{dx}{dt}$$

$$\frac{dx}{dt} = v$$

$$dx = v dt$$

$$\int_{x_i}^{x_f} dx = \int_{t_1}^{t_2} v dt = \text{Area Under Curve from } t=t_1 \text{ to } t=t_2$$

$$x_f - x_i = \text{Area Under Curve}$$

$$\text{Displacement} = \text{Area Under Curve}$$

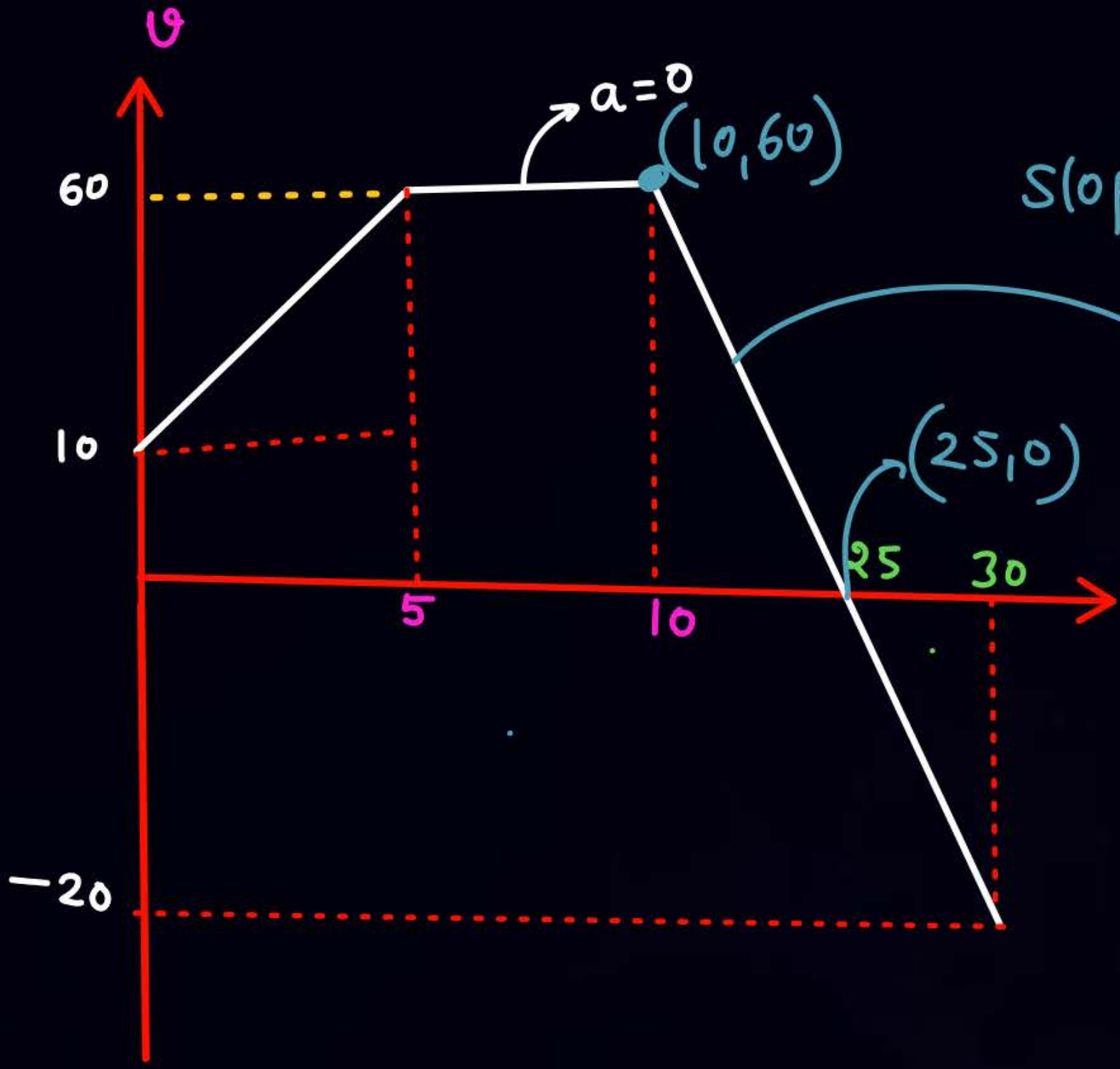
$$\int_{x_1}^{x_2} y dx = \text{Area}$$



~~\*\*~~ (v-t) graph ka area  $\Rightarrow$  Displacement Dega

Q

+



$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{slope} = \frac{0 - 60}{25 - 10}$$

$$= \frac{-60}{15}$$

$$a = -4$$



15. The motion of a particle along a straight line is described by equation  $x = 8 + 12t - t^3$  where  $x$  is in metre and  $t$  in second. The retardation of the particle when its velocity becomes zero is:

[2012]

(1)  $24 \text{ m s}^{-2}$

(2) zero

(3)  $6 \text{ m s}^{-2}$

(4)  $12 \text{ m s}^{-2}$

eq 4

**18.** Motion of a particle is given by equation  $s = (3t^3 + 7t^2 + 14t + 8)$  m. The value of acceleration of the particle at  $t = 1$  sec is:

**[2000]**

(1)  $10 \text{ m/s}^2$

(2)  $32 \text{ m/s}^2$

(3)  $23 \text{ m/s}^2$

(4)  $16 \text{ m/s}^2$

(2)

12:43

11



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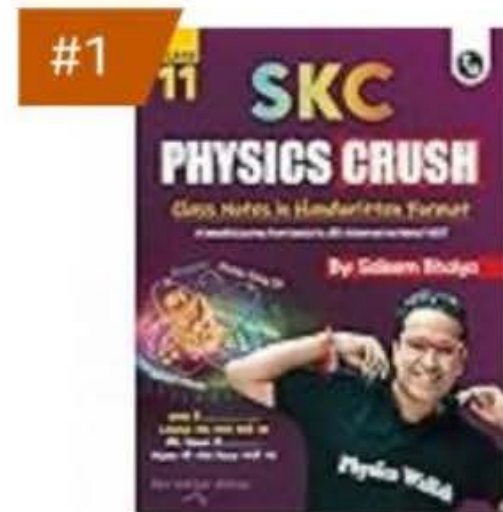


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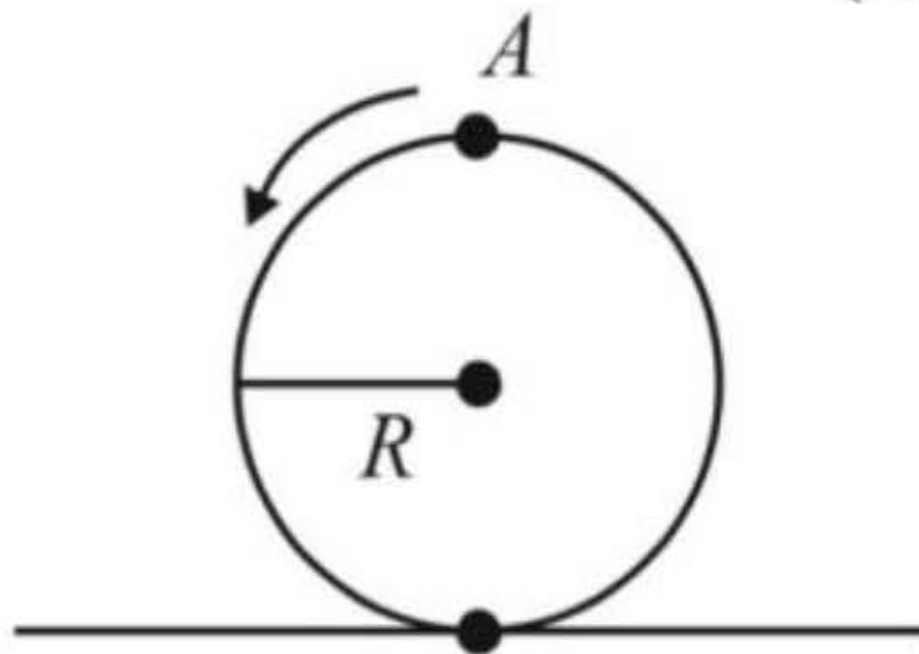
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- 149.** A disc is rolling without slipping on a surface. The radius of the disc is  $R$ . At  $t = 0$ , the top most point on the disc is  $A$  as shown in figure. When the disc completes half of its rotation, the displacement of point  $A$  from its initial position is:

(13 April 2023 – Shift 1)

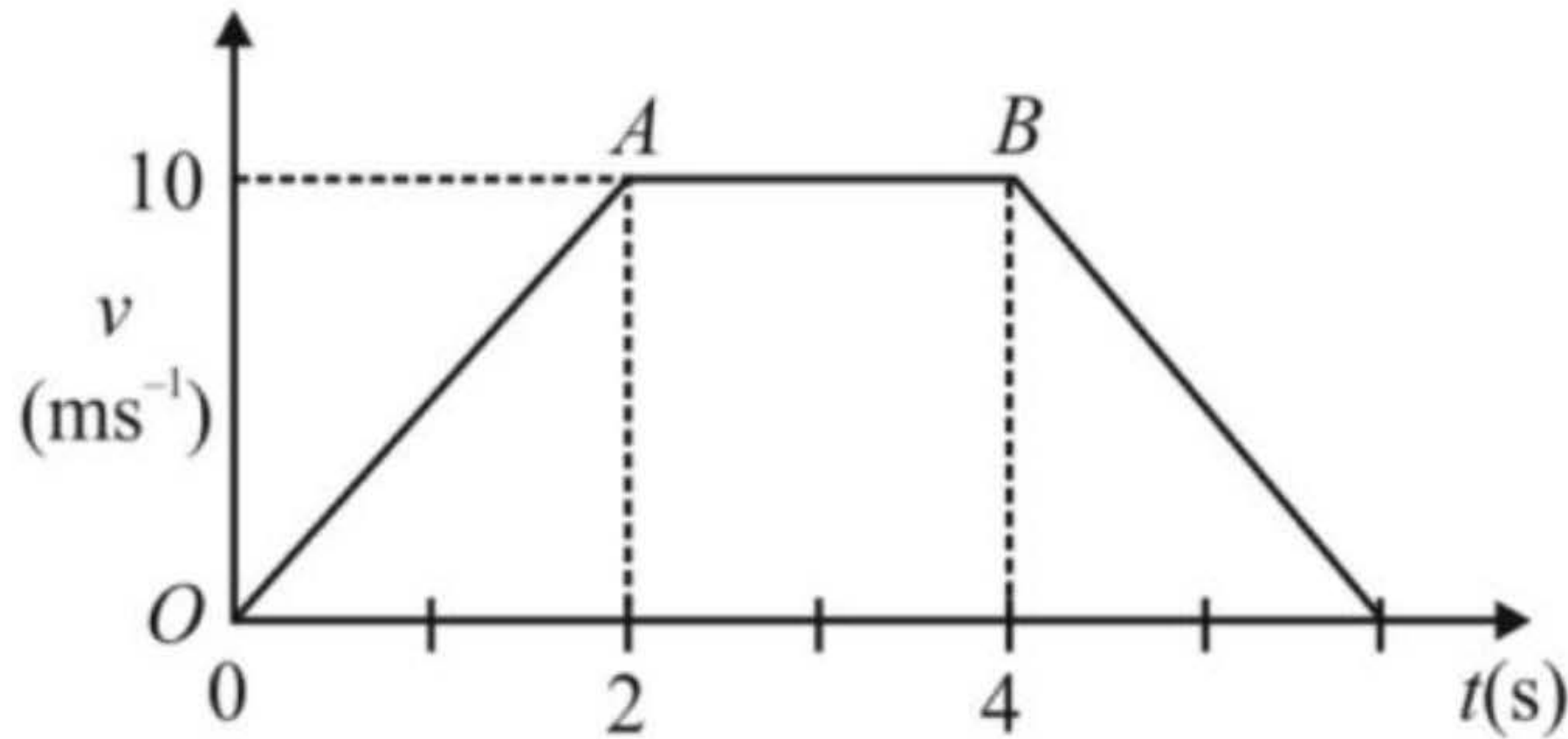


(2)

- |                           |                             |
|---------------------------|-----------------------------|
| (1) $2R$                  | (2) $R\sqrt{(\pi^2 + 4)}$   |
| (3) $R\sqrt{(\pi^2 + 1)}$ | (4) $2R\sqrt{(1 + 4\pi^2)}$ |

129. The velocity-time graph of an object moving along a straight line is shown in figure. What is the distance covered by the object between  $t = 0$  to  $t = 4$  s?

(28 Jan. 2025 - Shift 2)



(1)

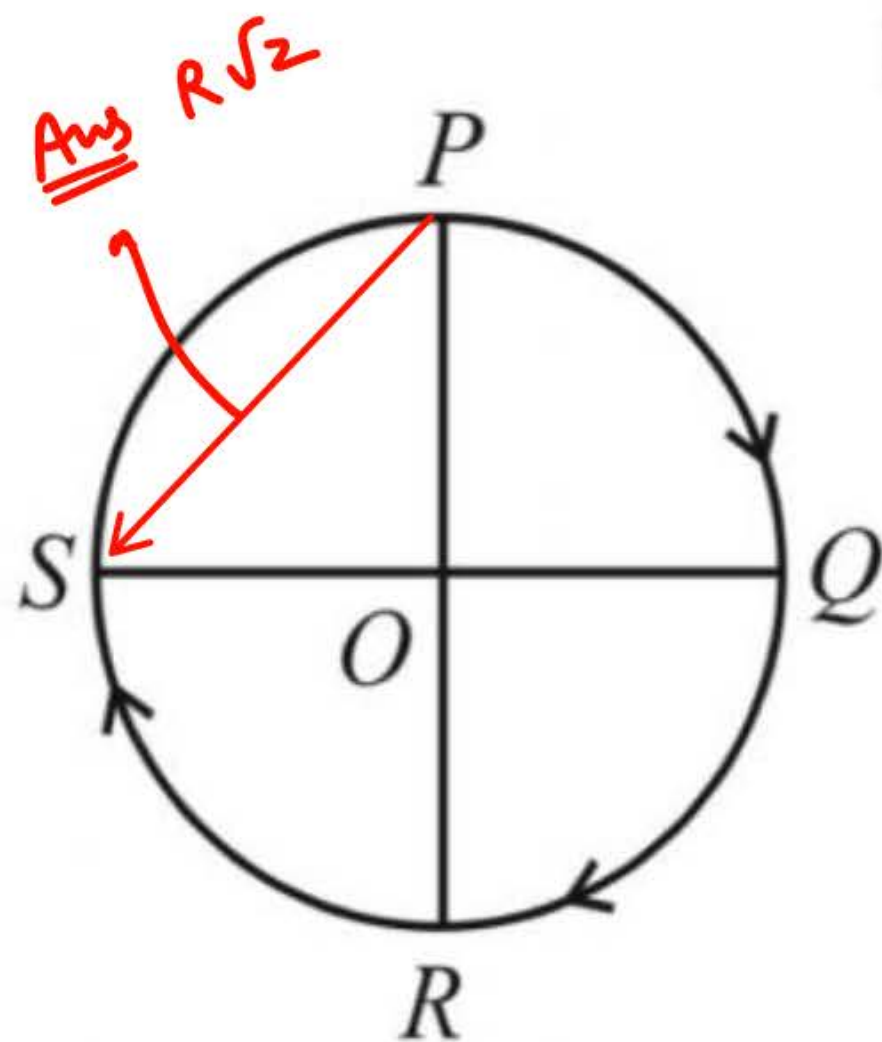
- (1) 30 m  
(3) 10 m

- (2) 11 m  
(4) 13 m



**119.** A cyclist starts from the point  $P$  of a circular ground of radius 2 km and travels along its circumference to the point  $S$ . The displacement of a cyclist is:

(04 Apr. 2024 - Shift 2)



(1)

(1)  $\sqrt{8}$  km

(2) 8 km

(3) 6 km

(4) 4 km

**113.** A particle is moving in a straight line. The variation of position ' $x$ ' as a function of time ' $t$ ' is given as  $x = (t^3 - 6t^2 + 20t + 15)$  m. The velocity of the body when its acceleration becomes zero is:

**(29 Jan. 2024 - Shift 2)**

(1) 4 m/s

(2) 8 m/s

(3) 10 m/s

(4) 6 m/s

(2)

**106.** A particle is moving in one dimension (along  $x$ -axis) under the action of a variable force. Its initial position was 16 m right of origin. The variation of its position ( $x$ ) with time ( $t$ ) is given as  $x = -3t^3 + 18t^2 + 16t$ , where  $x$  is in  $m$  and  $t$  is in  $s$ . The velocity of the particle when its acceleration becomes zero is \_\_\_\_\_ m/s.  
(01 Feb. 2024 - Shift 1)

(52)



**105.** The position of a particle related to time is given by  $x = (5t^2 - 4t + 5)\text{m}$ . The magnitude of velocity of the particle at  $t = 2\text{ s}$  will be: **(15 April 2023 - Shift 1)**

(1)  $0.6\text{ ms}^{-1}$

(2)  $14\text{ ms}^{-1}$

(3)  $10\text{ ms}^{-1}$

(4)  $16\text{ ms}^{-1}$

(4)

**103.** The distance travelled by an object in time  $t$  is given by  $s = (2.5)t^2$ . The instantaneous speed of the object at  $t = 5$  s will be: **(13 April 2023 - Shift 2)**

(1)  $25 \text{ ms}^{-1}$

(2)  $5 \text{ ms}^{-1}$

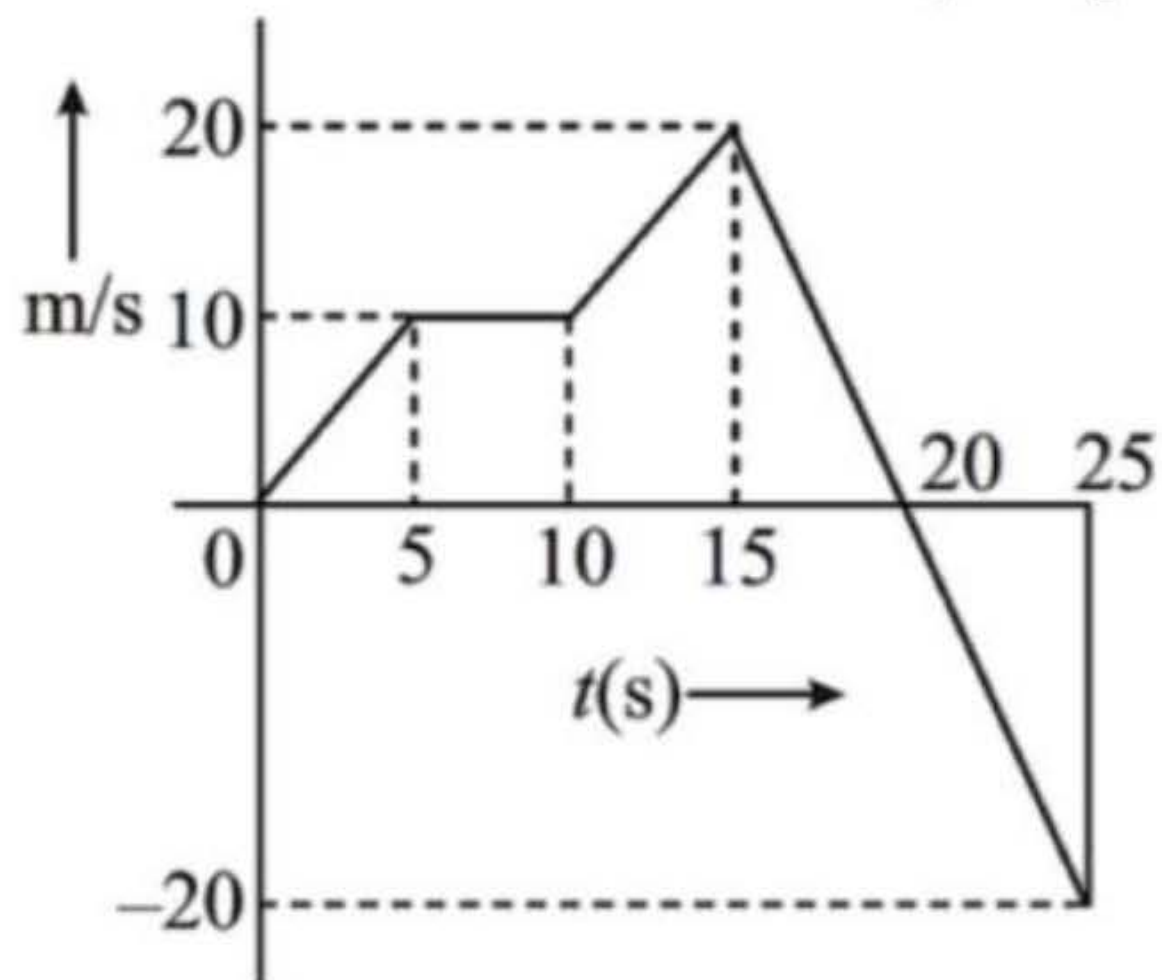
(3)  $62.5 \text{ ms}^{-1}$

(4)  $12.5 \text{ ms}^{-1}$

(1)

**100.** Form the  $v - t$  graph shown, the ratio of distance to displacement in 25 s of motion is:

(11 April 2023 - Shift 1)



(3)

(1) 1

(2)  $1/2$

(3)  $5/3$

(4)  $3/5$



**96.** Given below are two statements:

**Statement I:** Area under velocity-time graph gives the distance travelled by the body in a given time.

**Statement II:** Area under acceleration-time graph is equal to the change in velocity in the given time.

In the light of given statements, choose the correct answer from the options given below.

(08 April 2023 - Shift 2)

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is correct but Statement II is false
- (4) Statement I is incorrect but Statement II is true

(4)

**85.** The distance travelled by a particle is related to time  $t$  as  $x = 4t^2$ . The velocity of the particle at  $t = 5$  s is.

**(25 January 2023 - Shift 2)**

(1)  $40 \text{ ms}^{-1}$

(2)  $25 \text{ ms}^{-1}$

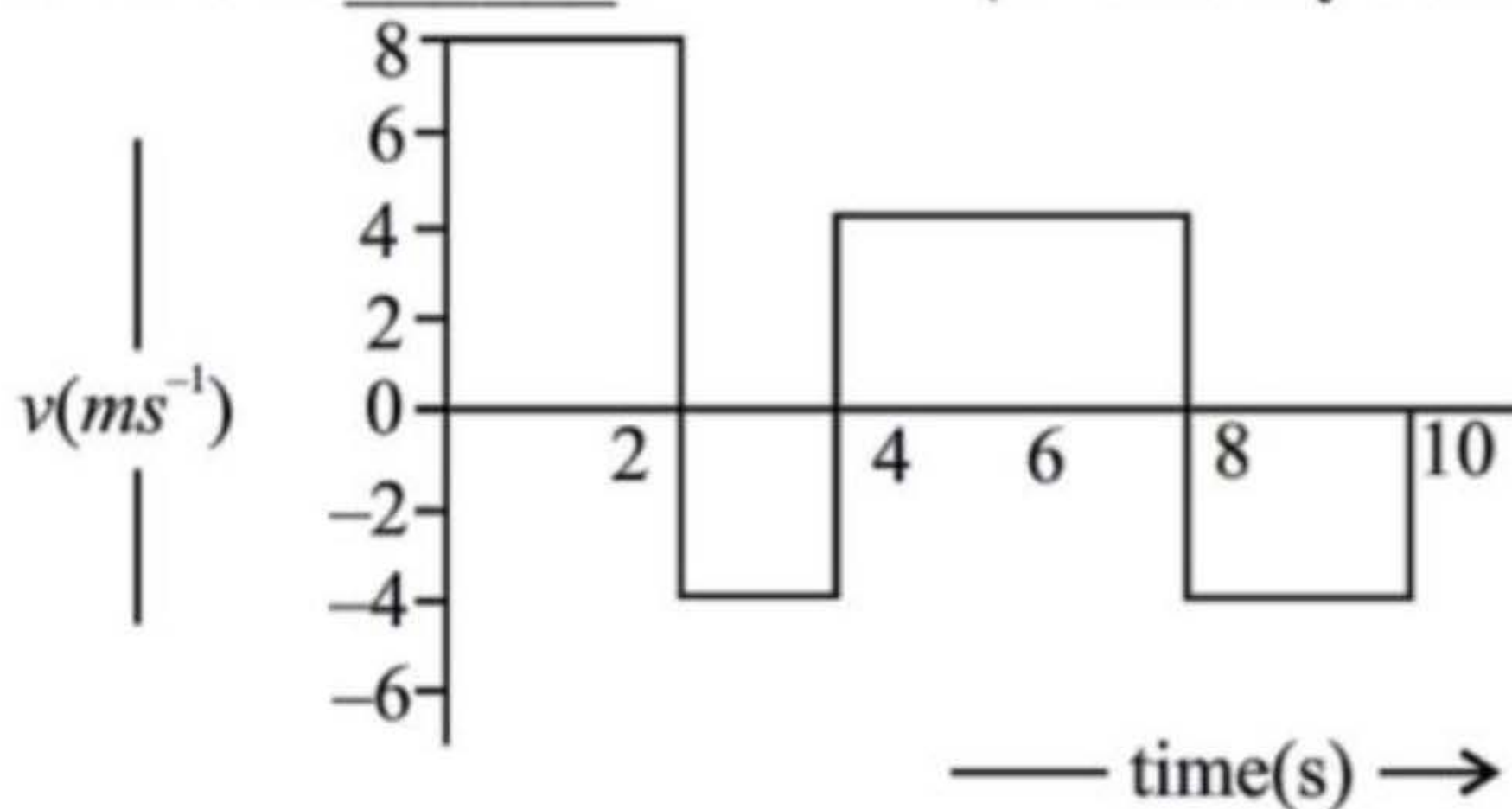
(3)  $20 \text{ ms}^{-1}$

(4)  $8 \text{ ms}^{-1}$

(1)

## MOTION IN ONE DIMENSION:

83. The velocity time graph of a body moving in a straight line is shown in figure. The ratio of displacement to distance travelled by the body in time 0 to 10 s is \_\_\_\_\_. (24 January 2023 - Shift 2)



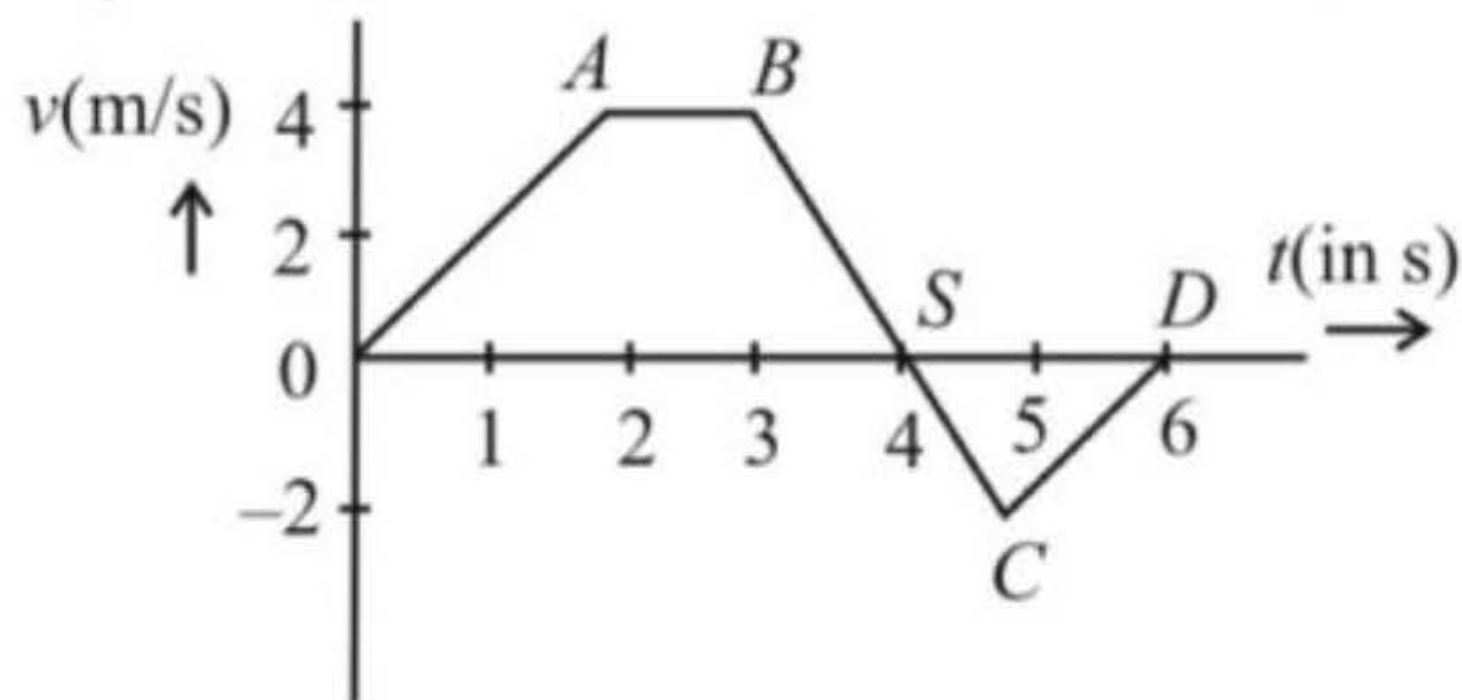
(4)

- (1) 1 : 1  
(3) 1 : 2

- (2) 1 : 4  
(4) 1 : 3



12. The velocity ( $v$ ) and time ( $t$ ) graph of a body in a straight line motion is shown in the figure. The point  $S$  is at 4.333 seconds. The total distance covered by the body in 6s is: **(JEE Main 2020)**

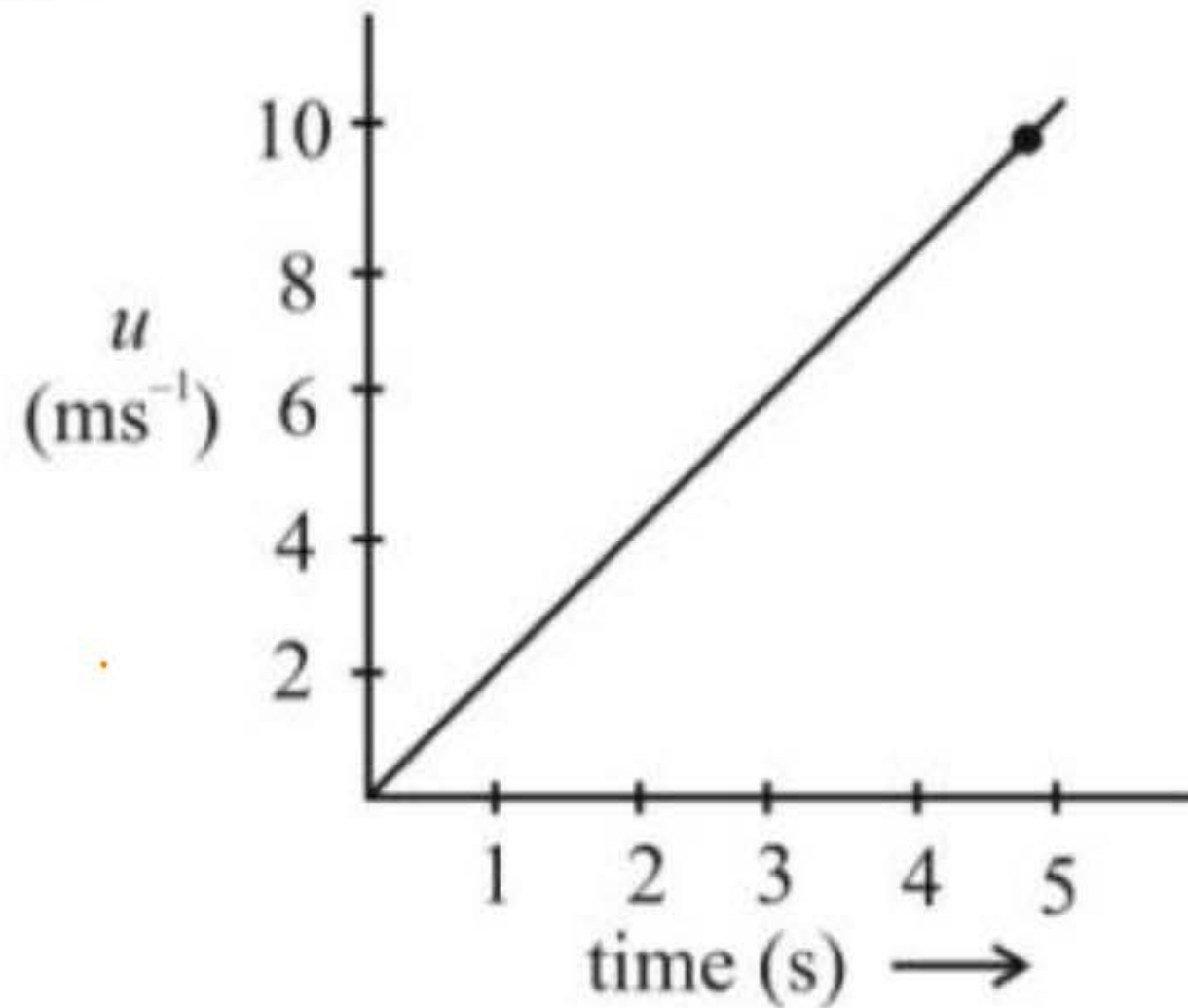


(4)

- |          |              |
|----------|--------------|
| (1) 12 m | (2) $49/4$ m |
| (3) 11 m | (4) $37/3$ m |

10. The speed versus time graph for a particle is shown in the figure. The distance travelled (in m) by the particle during the time interval  $t = 0$  to  $t = 5$  s will be \_\_\_\_\_.

(JEE Main 2020)



Ans (20)



## Homework

- Complete KPP-13 (vedio sol<sup>n</sup> is already uploaded)
  - many ques are very good  
Agar Doubt aye to  
vedio sol<sup>n</sup> dekh lena
- KPP(14)
  - Sunday H.w.
- DPP-05 (Sunday)



**THANK**  
**YOU**