

YAKEEN NEET 2.0

2026

Kinematics - -

Motion in a straight line

PHYSICS

Lecture - 04

By - Saleem Ahmed Sir

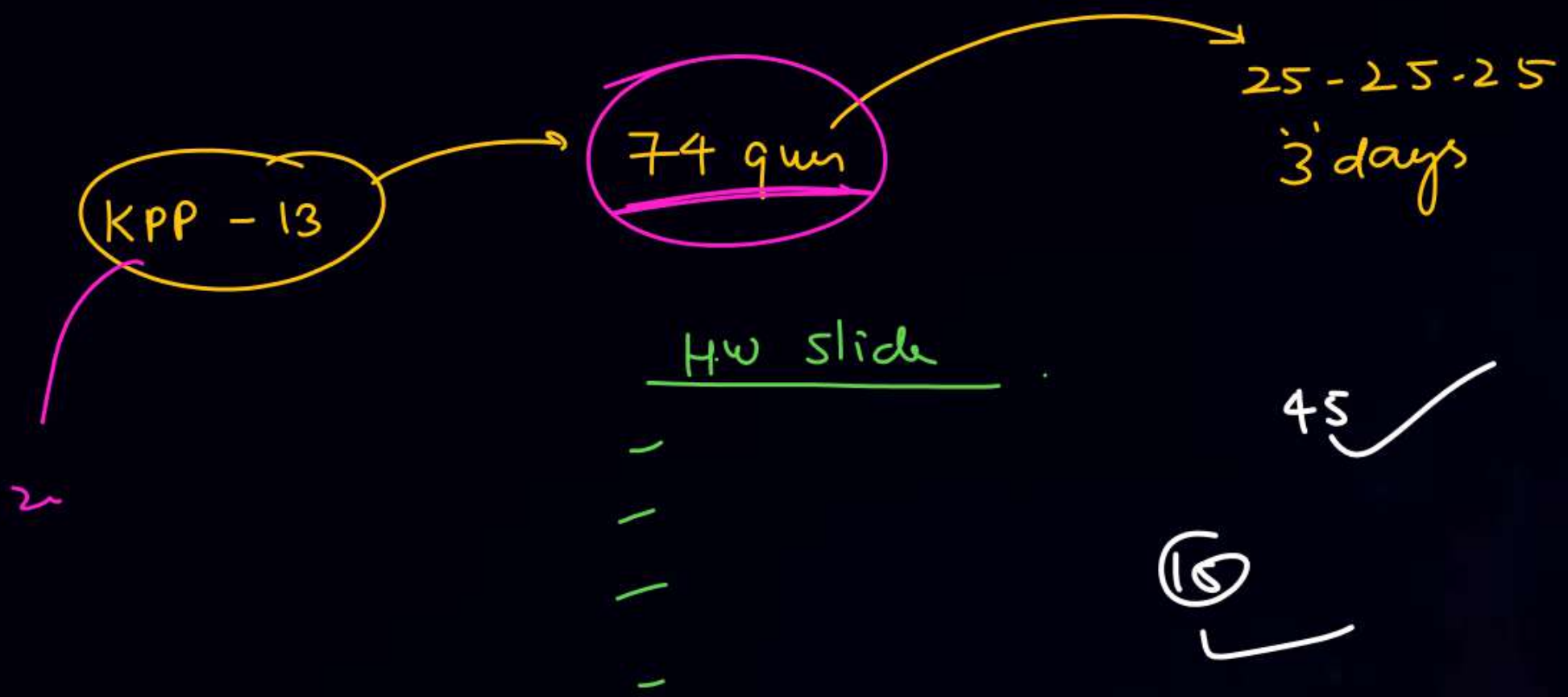




Today's Goal

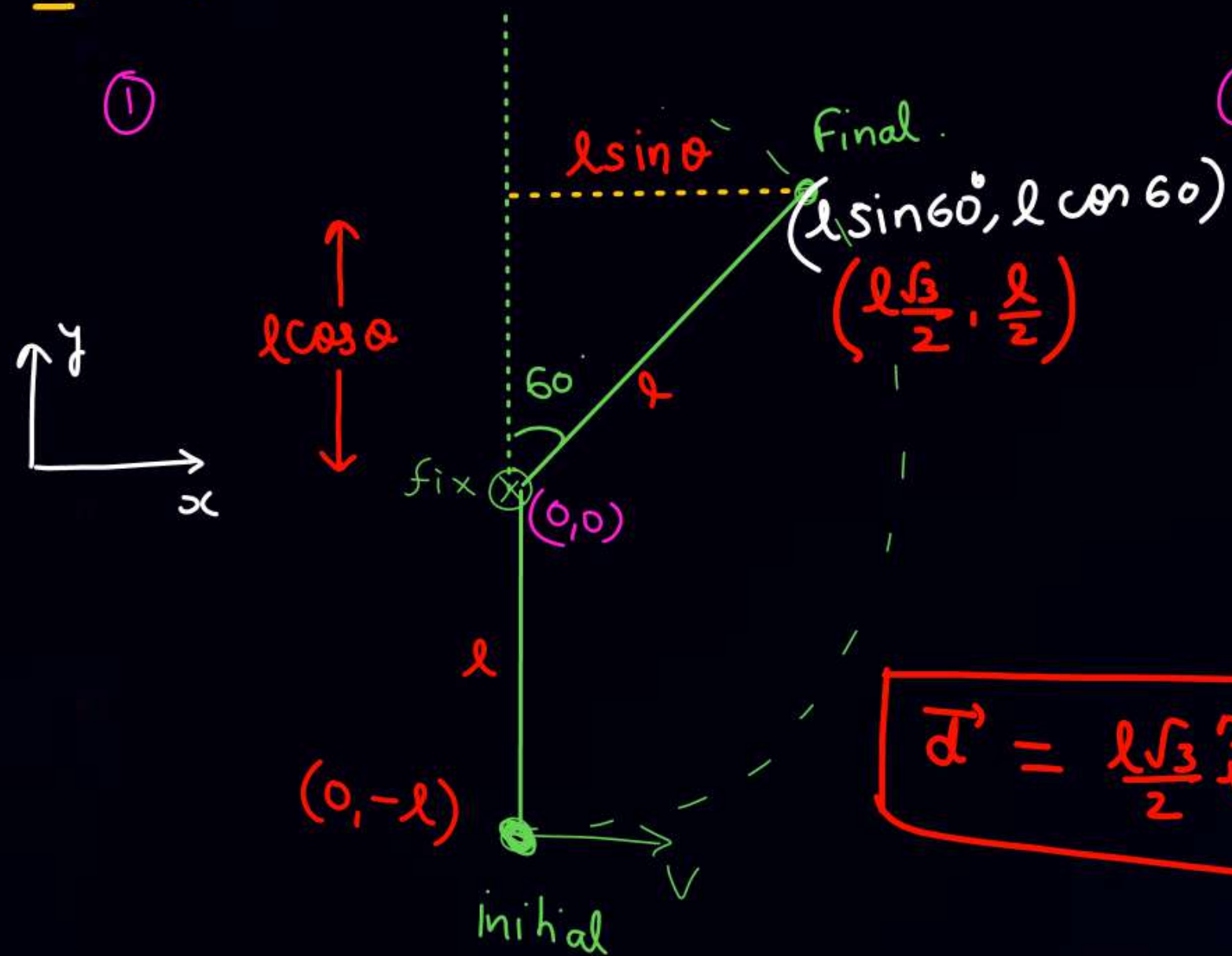
-

Average Speed And Average Velocity

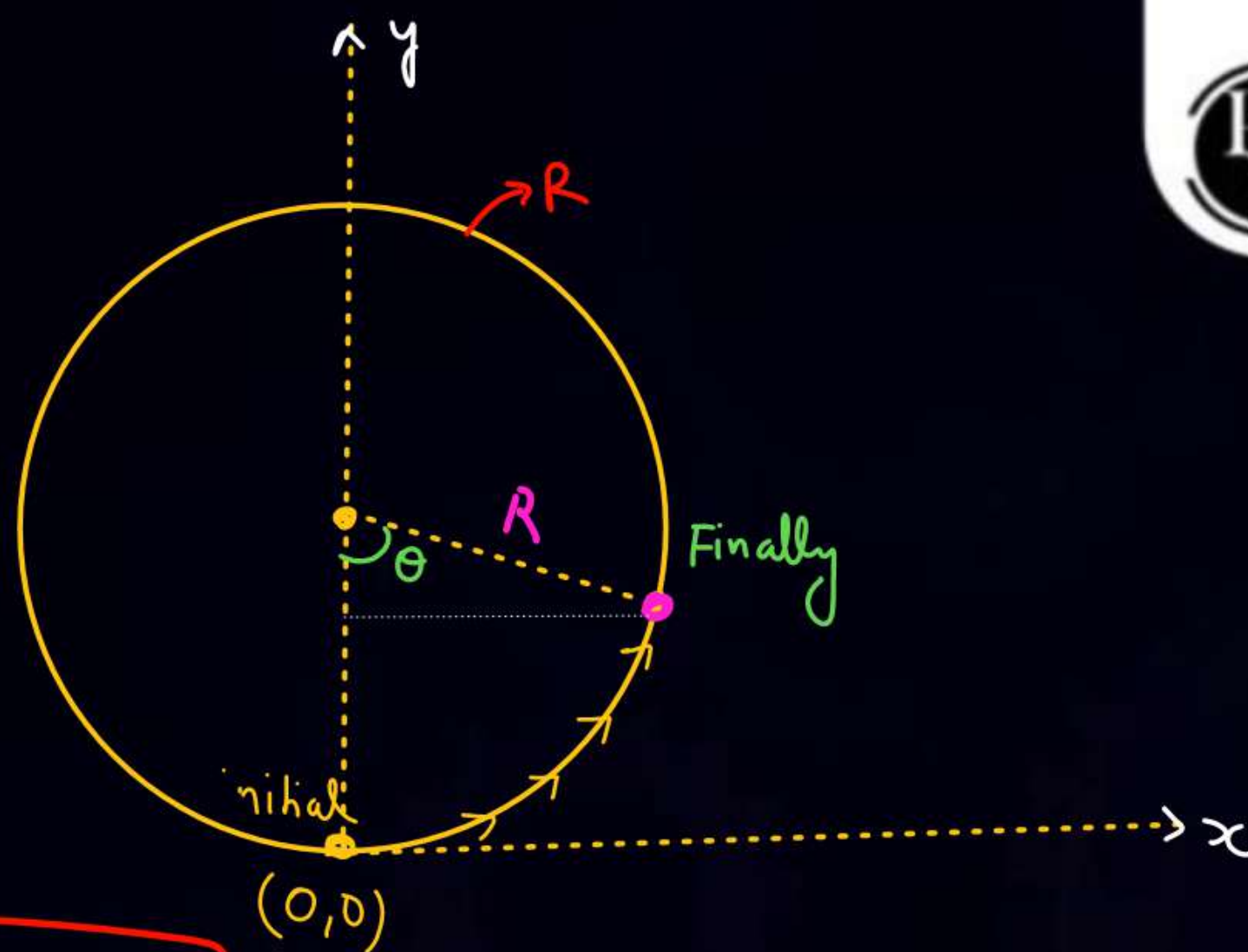


Q find \vec{d}

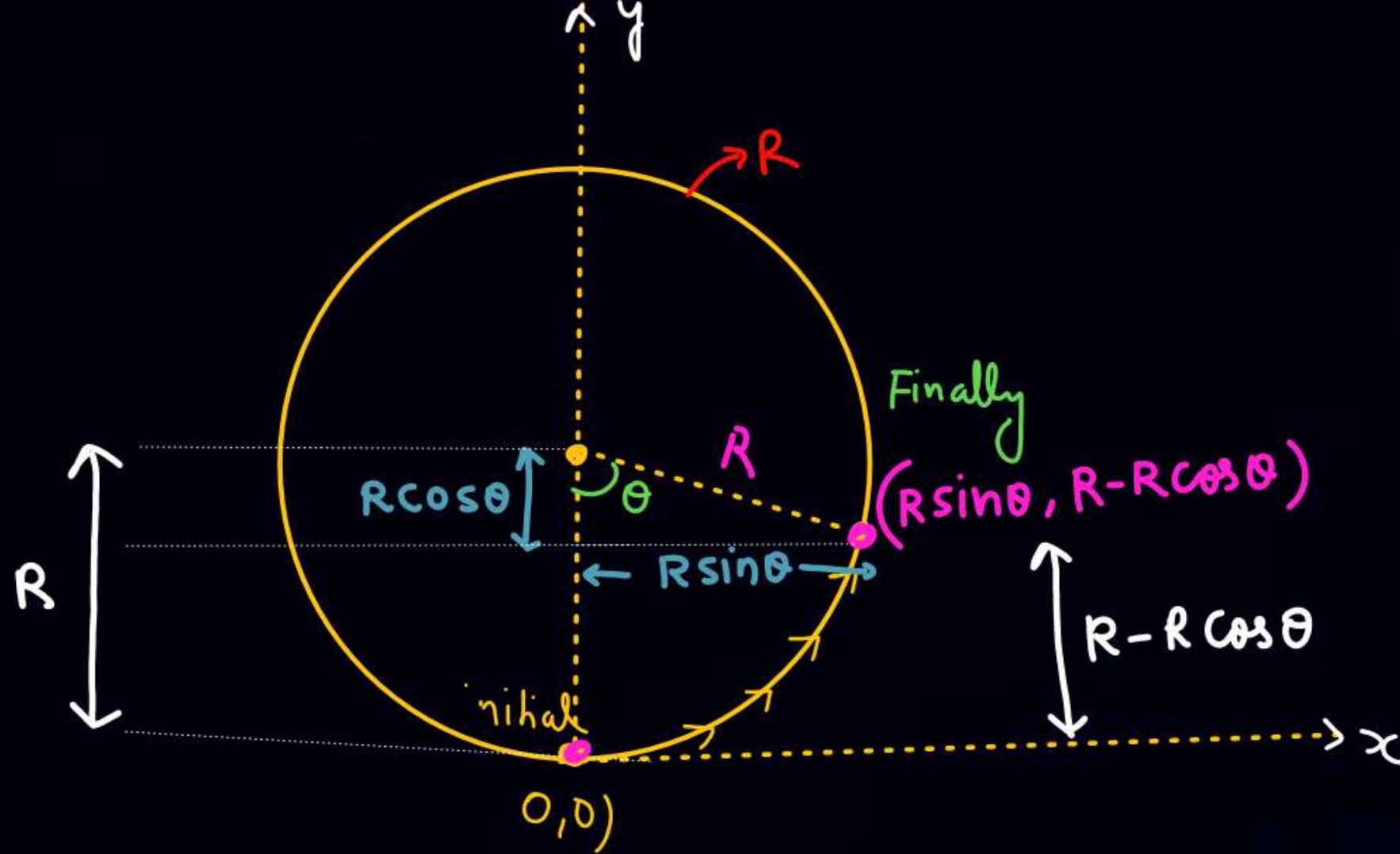
①



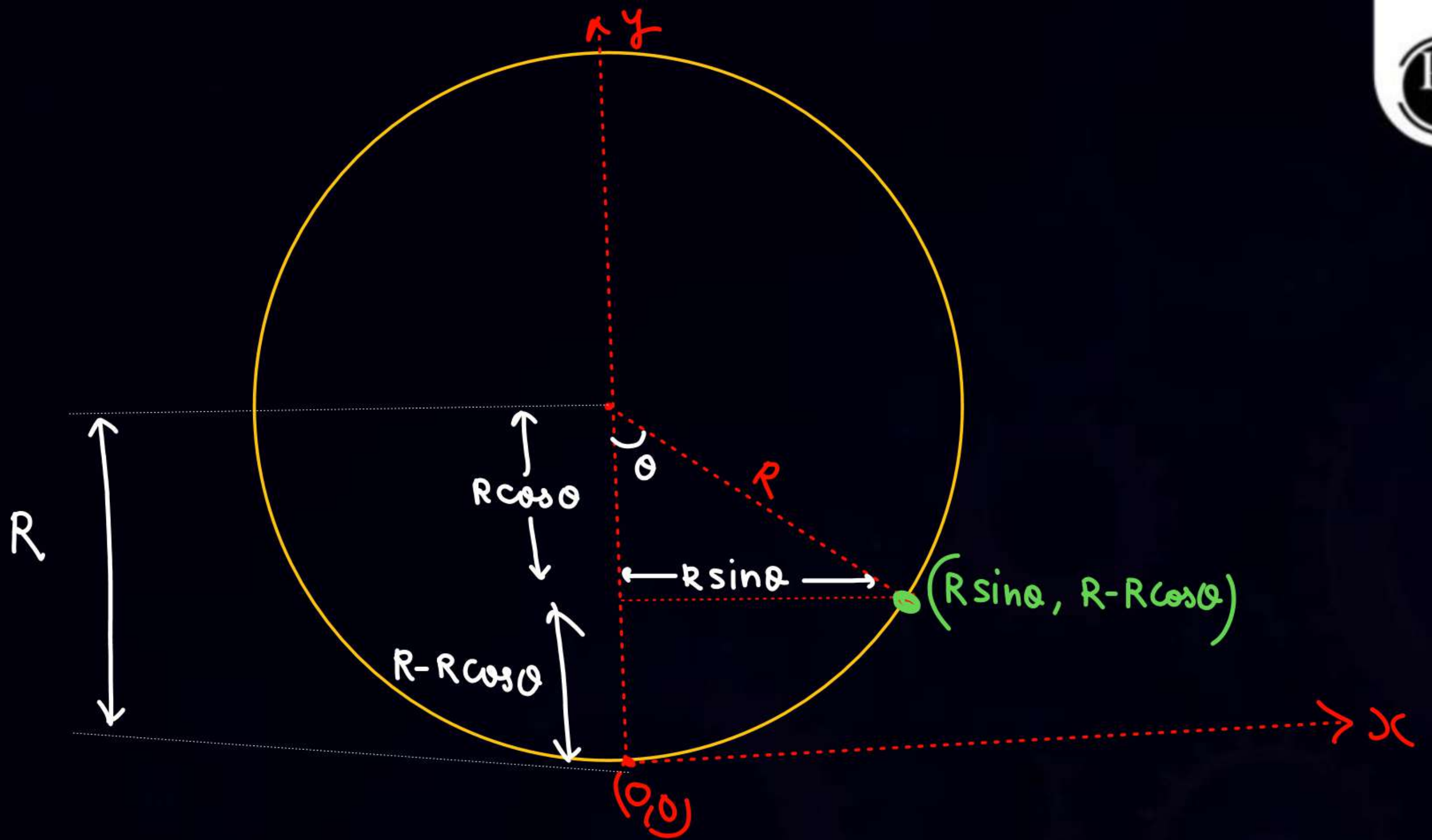
②

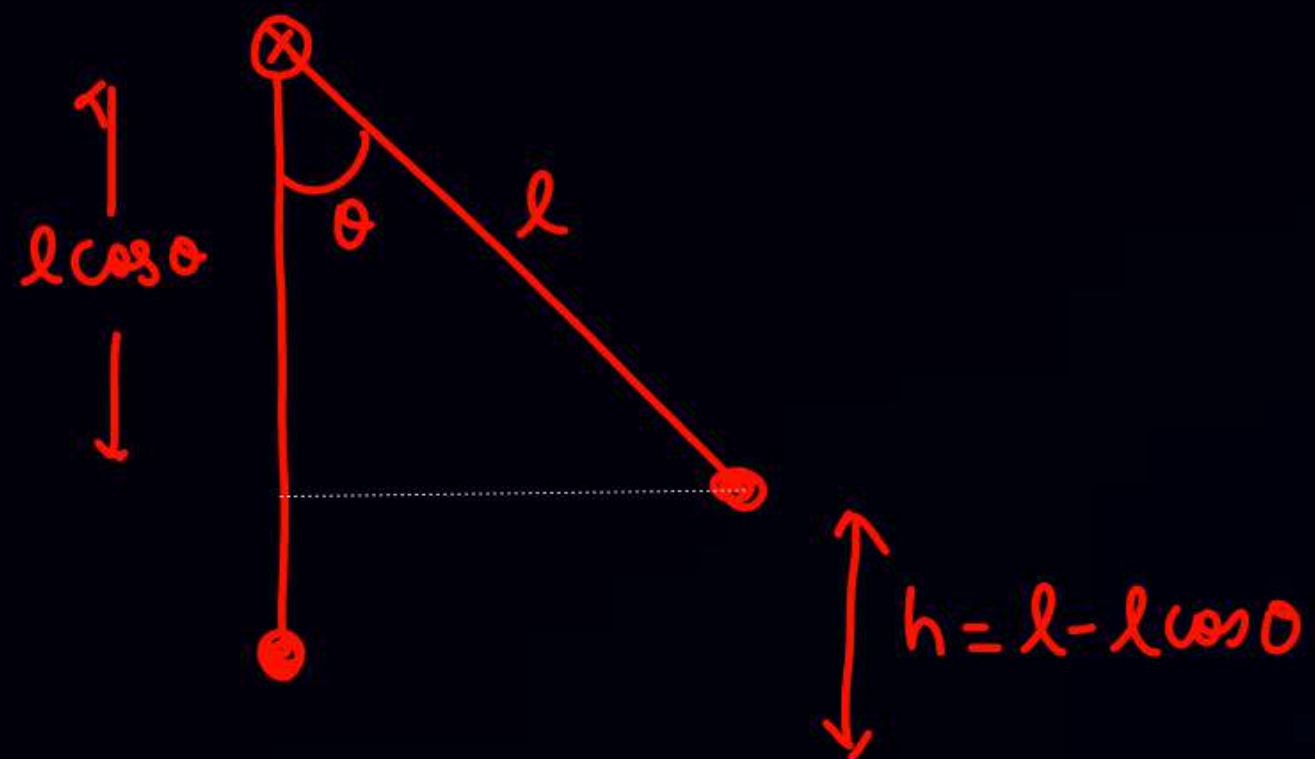


$$\vec{d} = \frac{l\sqrt{3}}{2} \hat{i} + \frac{3l}{2} \hat{j}$$



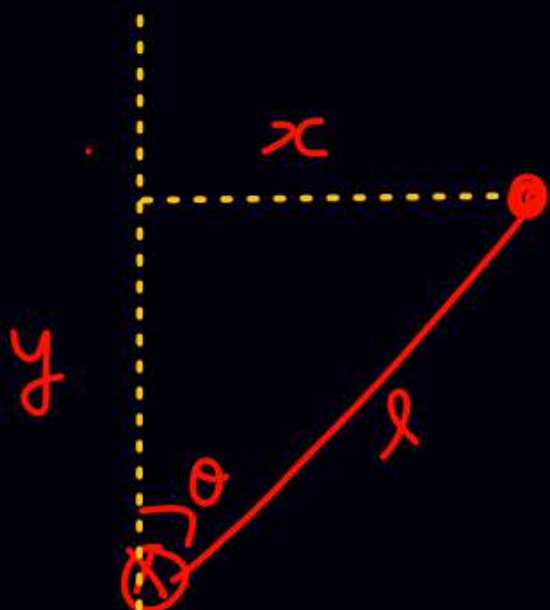
$$\vec{d} = R \sin \theta \hat{i} + (R - R \cos \theta) \hat{j}$$





xxskc

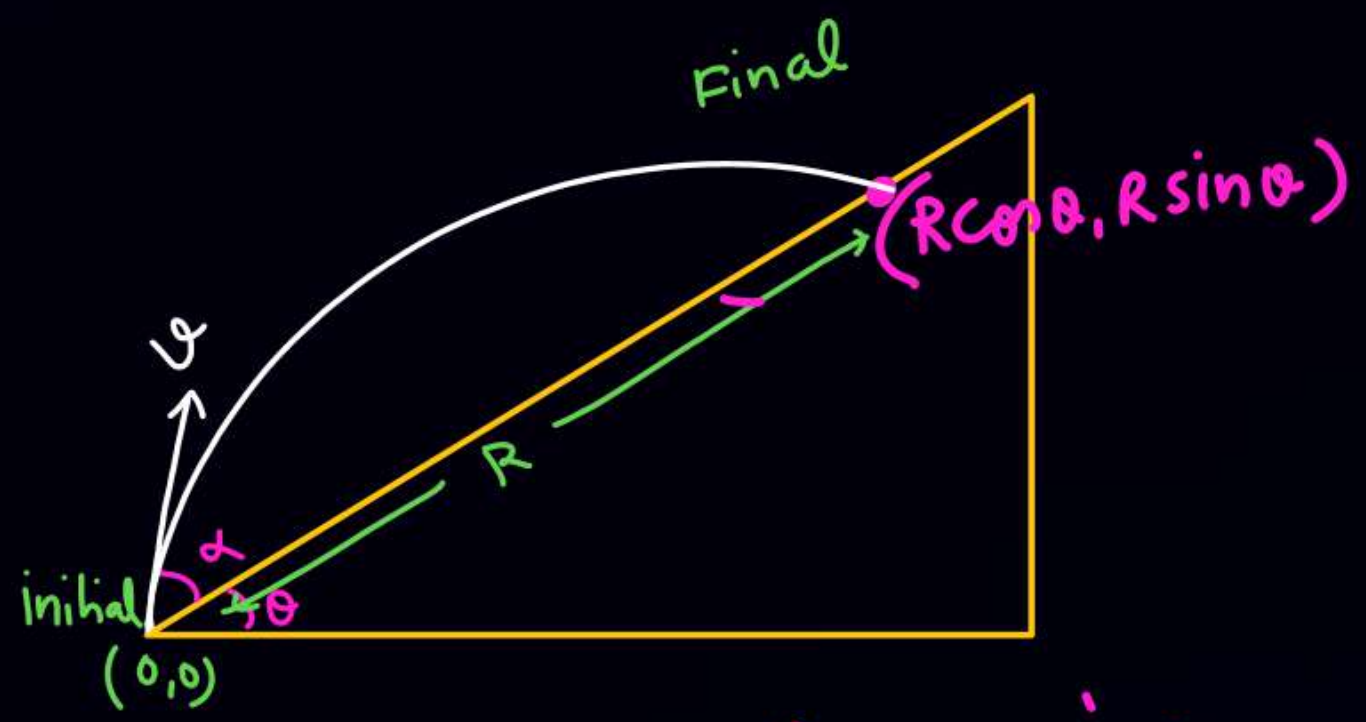
Kisi point ka Co-ordinate Batam ke liye ye
dekho ki origin kahan hai



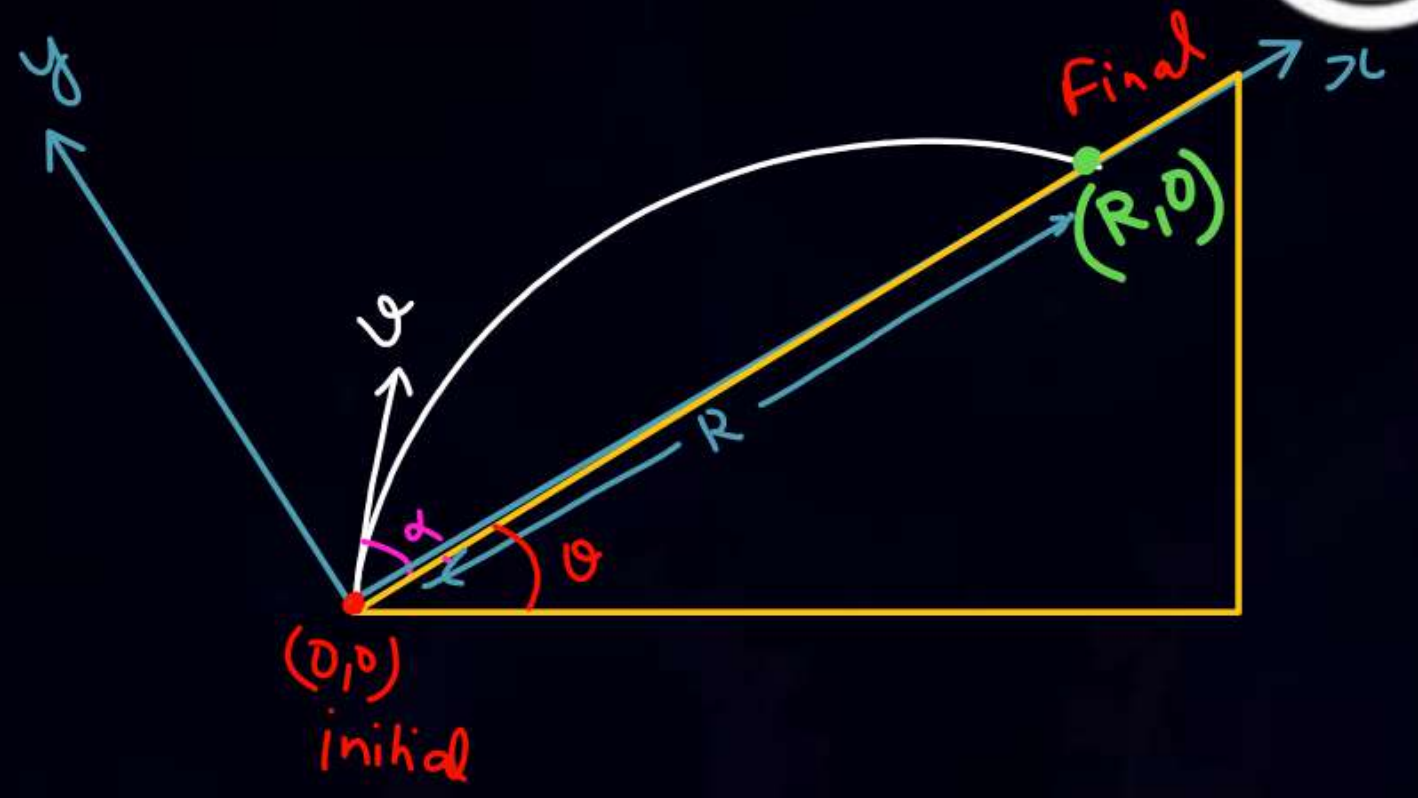
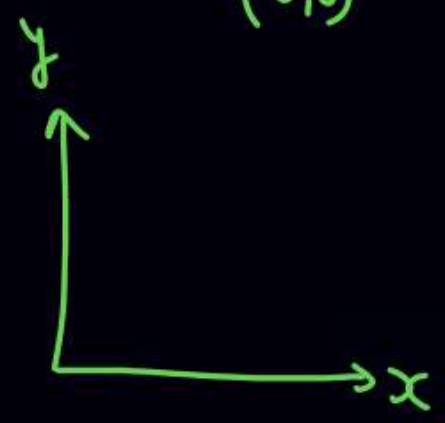
$$\sin \theta = \frac{x}{l}, \quad x = l \sin \theta$$

$$\cos \theta = \frac{y}{l}, \quad y = l \cos \theta$$

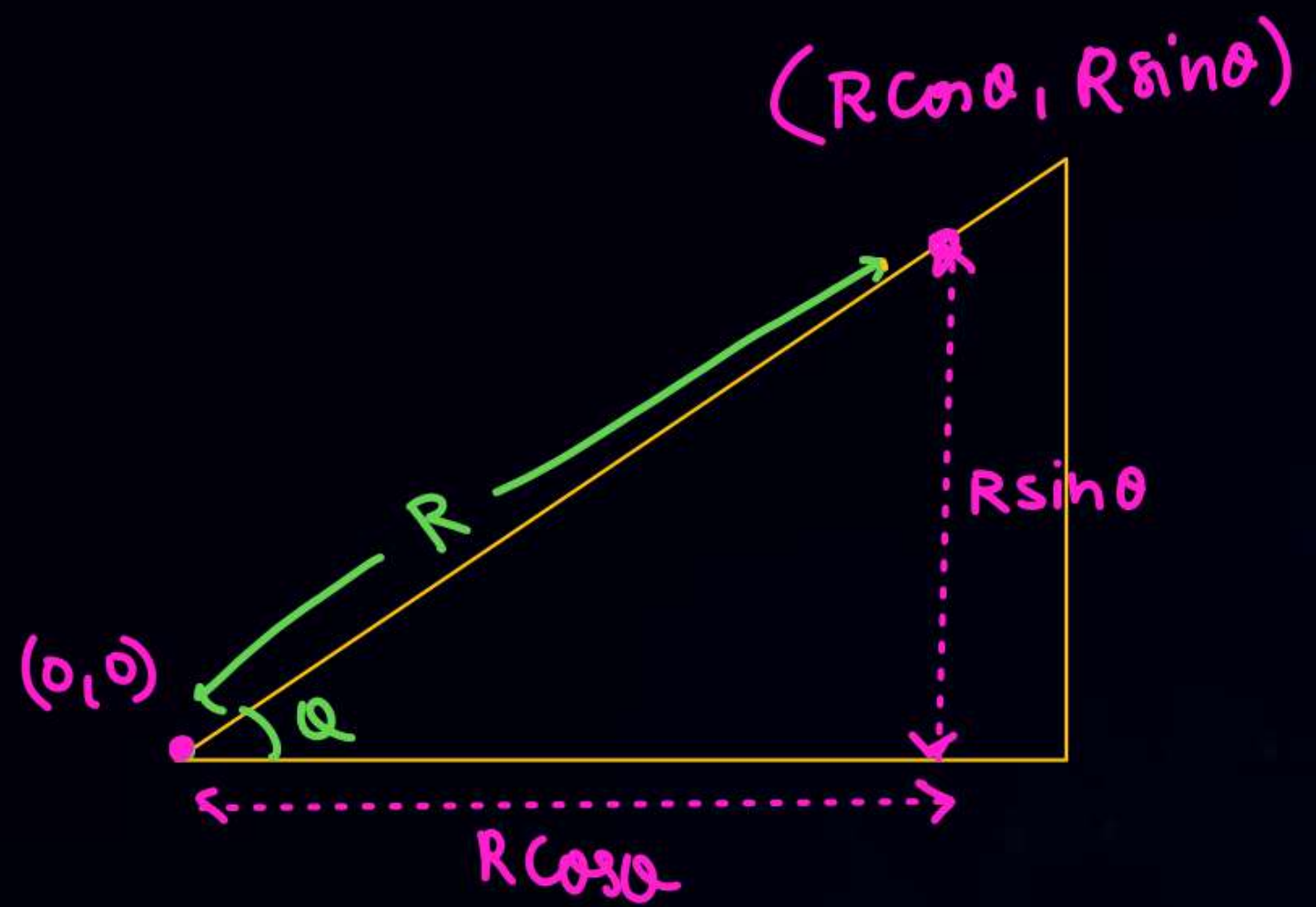
③

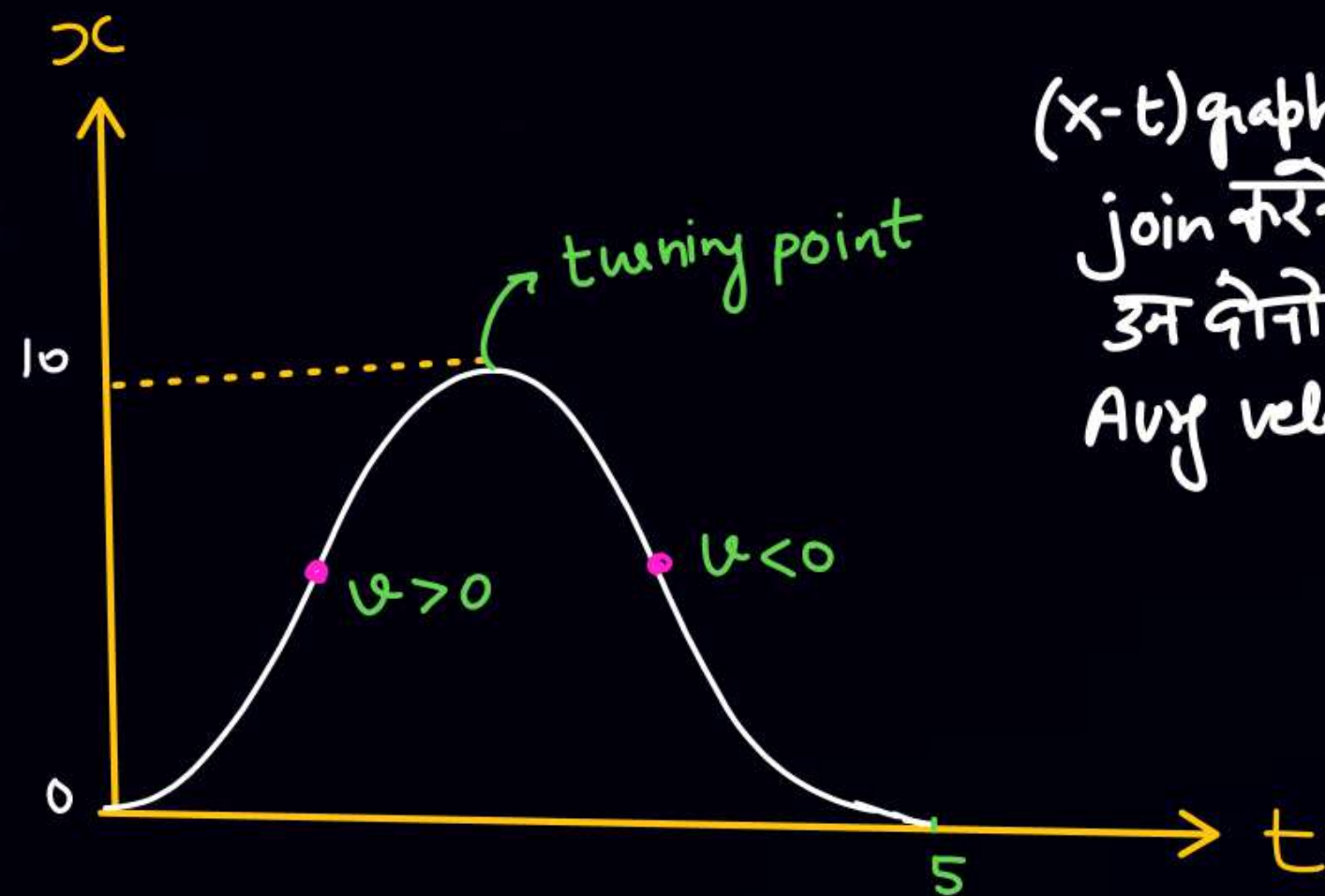


$$\vec{d} = R \cos \theta \hat{i} + R \sin \theta \hat{j}$$

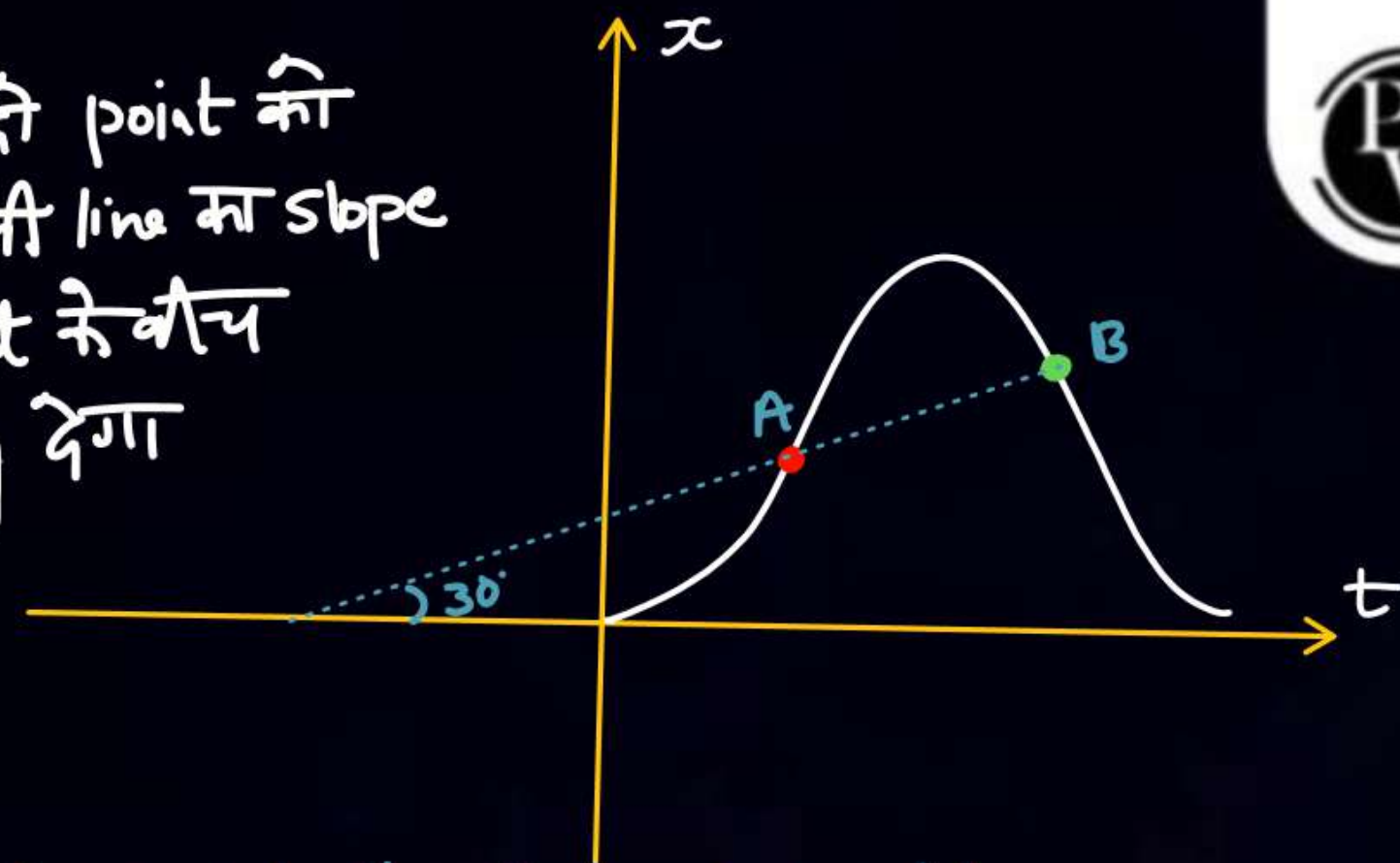


$$\vec{d} = R \hat{i}$$





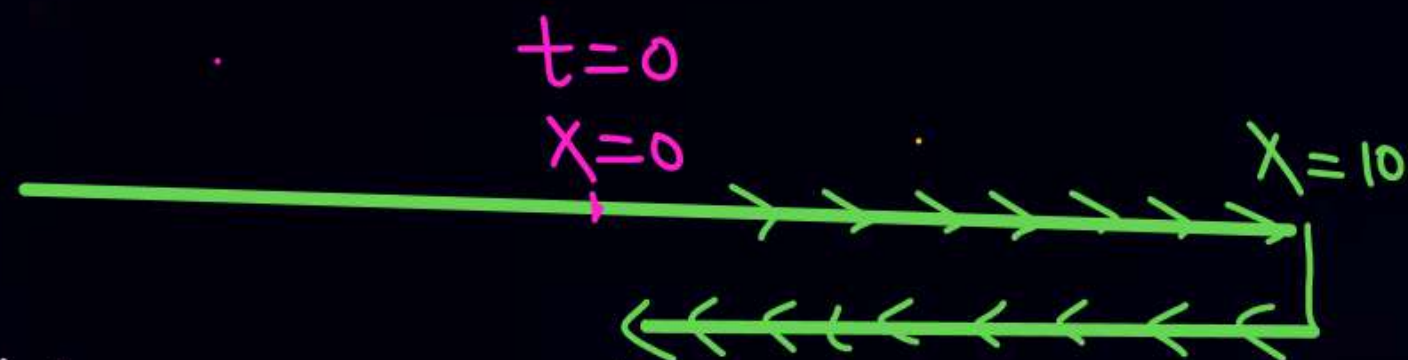
(x-t) graph में दो point को join करने वाली line का slope un dono point ke beech Avg velocity dega



Avg velocity from A to B
 = Slope of the line joining to A to B
 = $\tan \theta = \tan 30^\circ$

skc

*** (x-t) graph me do point ko join krne wali st. line ka slope un dono point ke beech Avg velocity dega.



Distance = $10 + 10 = 20$
 $\vec{d} = 0$

Q A particle is moving on x-axis such that its (x-t) co-ordinate is given as

(1D)

$$x = t^2 - 4t + 10.$$

① Find Avg velocity from $t=0$ to $t=3$ sec

$$t=0, x_i = 10$$

$$t=3, x_f = 3^2 - 4 \times 3 + 10 = 7 \Rightarrow \text{Avg velocity} = \frac{x_f - x_i}{\text{total time}} = \frac{7 - 10}{3 - 0} = -1 \hat{i}$$

\Rightarrow
~~* Sir~~ ~~* Sir~~ Differ Nahi karenge
 \hat{i} kyo \Rightarrow No.

SKC

Avrg velocity ke liye
x ko diff Nahi karna hai

Q $x = t^2 - 4t + 10$

① Find Avrg velocity from $t=0$ to $t=5$ sec

$$\langle \vec{v} \rangle = \frac{x_f - x_i}{\text{total time}} \Rightarrow \begin{aligned} t=0, \quad x_i &= 0^2 - 0 + 10 = 10 \\ t=5, \quad x_f &= 5^2 - 4 \times 5 + 10 = 15 \end{aligned}$$

$$\langle \vec{v} \rangle = \frac{15 - 10}{5} = 1$$

$$\langle \vec{v} \rangle = 1 \hat{i}$$

② Find velocity at $t=5$ sec

$$v = \frac{dx}{dt} = 2t - 4$$

$$t=5, \quad v = 2 \times 5 - 4 = 6$$

काम का सूत्र

* Avg velocity के लिए x को diff Nahi karna hai

direct $\frac{x_f - x_i}{\text{time}}$ karna hai

* $v = \frac{dx}{dt}$
 → inst. velocity.

Avg velocity के लिए

→ No diff. की जरूरत

→ Na Raste Ki jarurat.

*

x

x



Q $x = t^2 - 6t + 5$

① $t=0 \longrightarrow t=4$

$$\text{Avg velocity} = \frac{-3-5}{4-0} = -2$$

$$= -2 \hat{i}$$

$t=0 \quad x_i = 5$

$t=4 \quad x_f = 4^2 - 6 \times 4 + 5$
 $= -3$

② At $t=3$, $v =$

$$v = \frac{dx}{dt} = 2t - 6$$

$$t=3, \quad v = 2 \times 3 - 6 = 0$$

③ $t=0 \longrightarrow t=6$

$t=0, \quad x_i = 5$

$t=6, \quad x_f = 6^2 - 6 \times 6 + 5 = 5$

$$\text{Avg velocity} = \frac{x_f - x_i}{\text{time}} = \frac{5-5}{6} = 0$$

Avg speed matlab hai . . . Khatra (Denger)

Q $x = t^2 - 6t + 5$

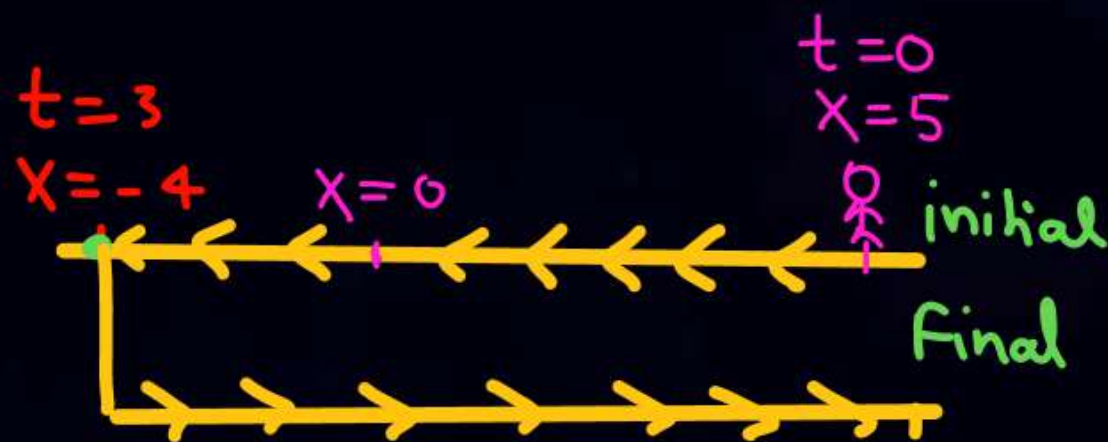
find Avg speed from
 $t=0$ to $t=6\text{sec}$

Sol Avg Speed = $\frac{\text{Distance}}{\text{time}}$ → Rasta

(Step 1) $t=0, x_i = 5$
 $t=6, x_f = 6^2 - 6 \times 6 + 5$
 $x_f = 5$

(Step 2) $v = 2t - 6 = 0$
 $t = 3$

put $t=3, x = 3^2 - 6 \times 3 + 5 = -4$



Distance = $9 + 9 = 18$

$\langle \text{speed} \rangle = \frac{18}{6}$

SKC methode

- ① sabse pahle x_i & x_f Nikalo
- ② find turning point Kab aur Kahan
- ③ Rasta Banao x_i se start karke turning point par jana hai or x_f Babar

turning pt par
Velocity zero
hogi



Q
H.W

$$x = t^2 - 4t + 10$$

find $\langle \text{speed} \rangle$ from $t=0$ to $t=3$ sec.

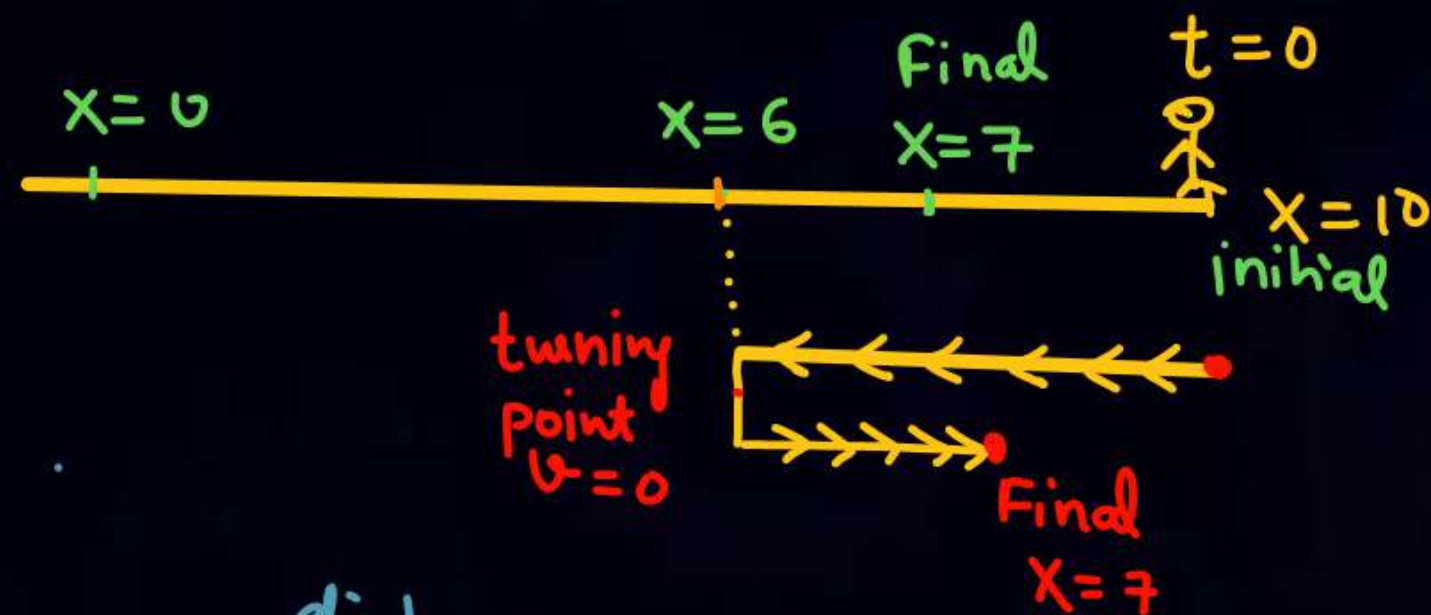
→ स्वरस

Solⁿ

$$\begin{cases} t=0, x_i = 10 \\ t=3, x_f = 3^2 - 4 \times 3 + 10 = 7 \end{cases}$$

$$\begin{cases} v = 2t - 4 = 0 \\ t = 2 \\ x = 2^2 - 4 \times 2 + 10 = 6 \end{cases}$$

at $t=2$



$$\text{distance} = 4 + 1 = 5$$

$$\langle \text{speed} \rangle = \frac{5}{3}$$

Q

$$x = t^2 - 6t + 10$$

① $t=0 \longrightarrow t=4$

Avg speed.

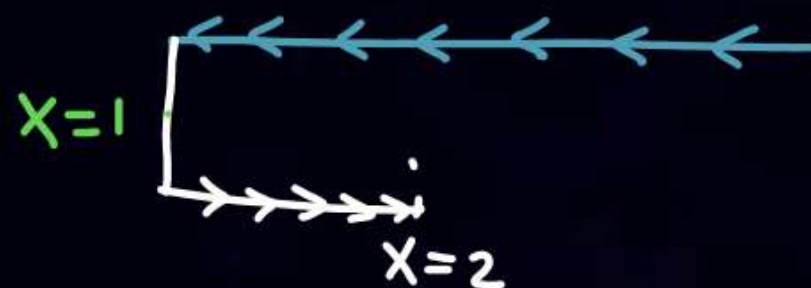
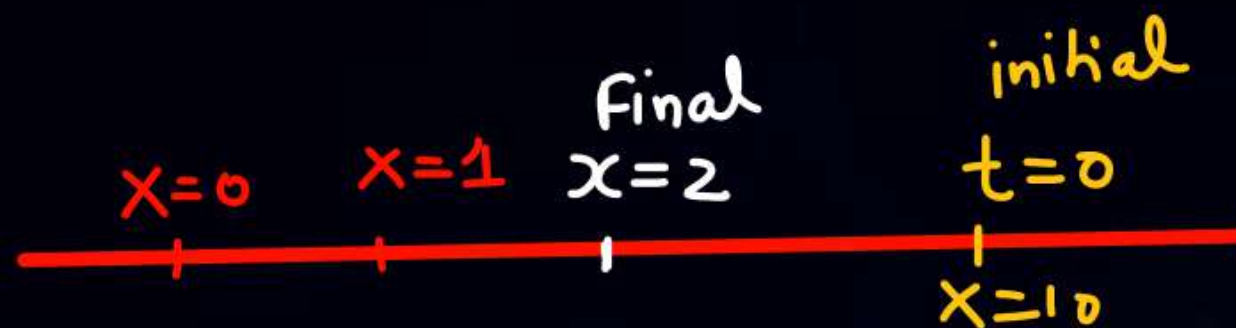
$$\begin{cases} t=0, x_i = 10 \\ t=4, x_f = 2 \end{cases}$$

$$v = 2t - 6 = 0$$

$$t = 3$$

$$x = 9 - 18 + 10 = 1$$

turning point



$$\text{Distance} = \frac{9+1}{4} = \frac{5}{2}$$

Q

$$x = t^2 - 6t + 10$$

$$\text{Avg velocity} = \frac{x_f - x_i}{\text{time}} = \frac{2 - 10}{2} = -4$$



① $t=0 \longrightarrow t=2$
Avg speed.

② Avg velocity.

sol $t=0, x_i = 10$

$t=2, x_f = 2$

turning point $2t - 6 = 0$
 $t=3, x=1$

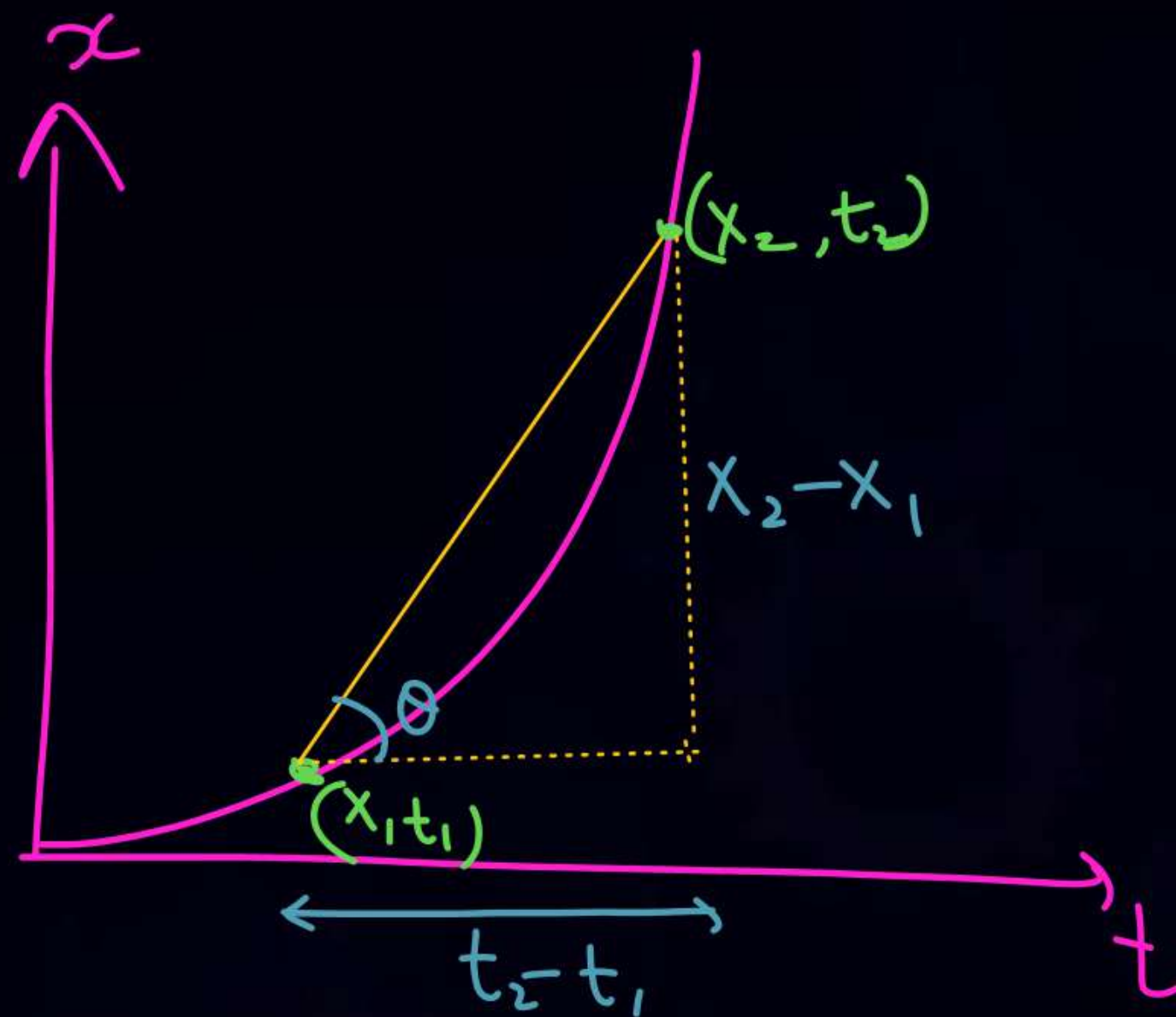


$$\langle \text{speed} \rangle = \frac{8}{2} = 4$$

$$\tan \theta = \frac{x_2 - x_1}{t_2 - t_1}$$

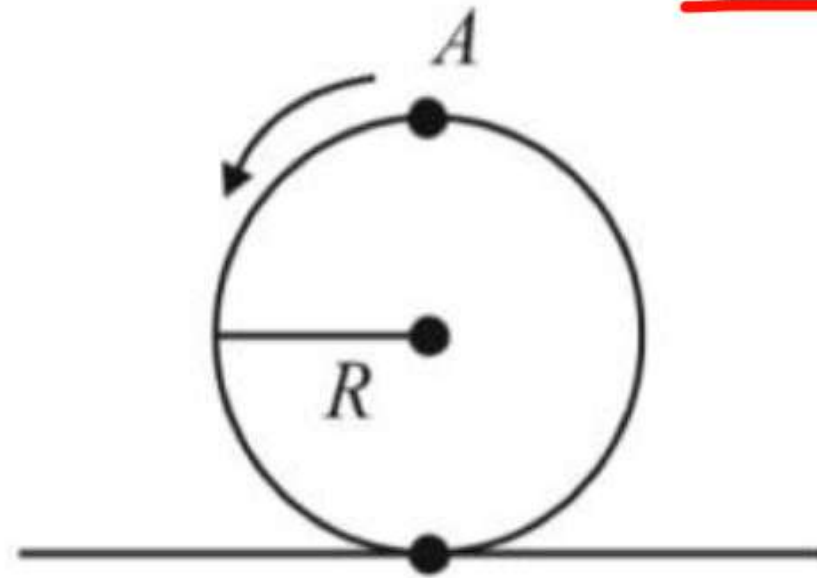
$$\tan \theta = \frac{\vec{x}_f - \vec{x}_i}{t_2 - t_1}$$

$$= \langle \vec{v} \rangle$$



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)

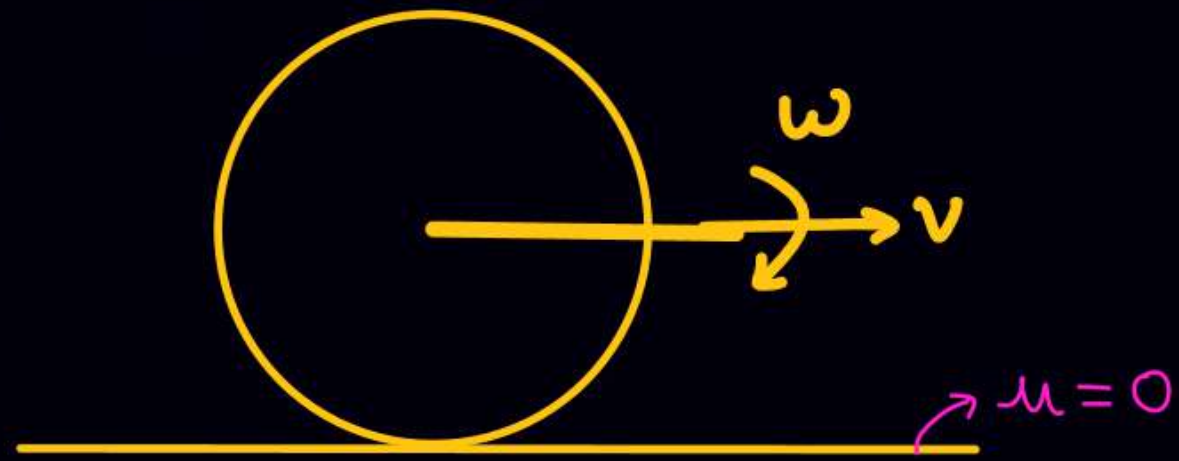


- (1) $2R$ (2) $R\sqrt{(\pi^2 + 4)}$
 (3) $R\sqrt{(\pi^2 + 1)}$ (4) $2R\sqrt{(1 + 4\pi^2)}$

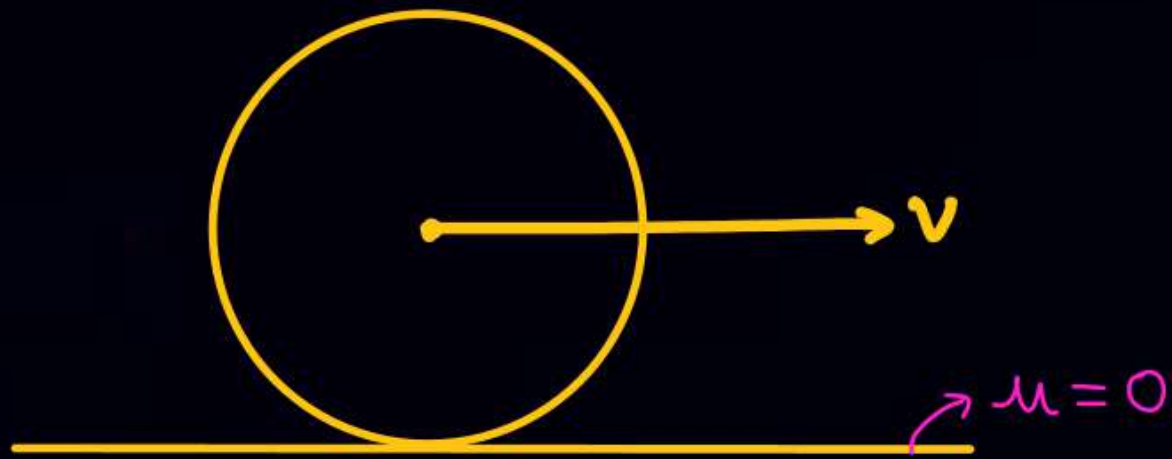
Module

Ex. 2

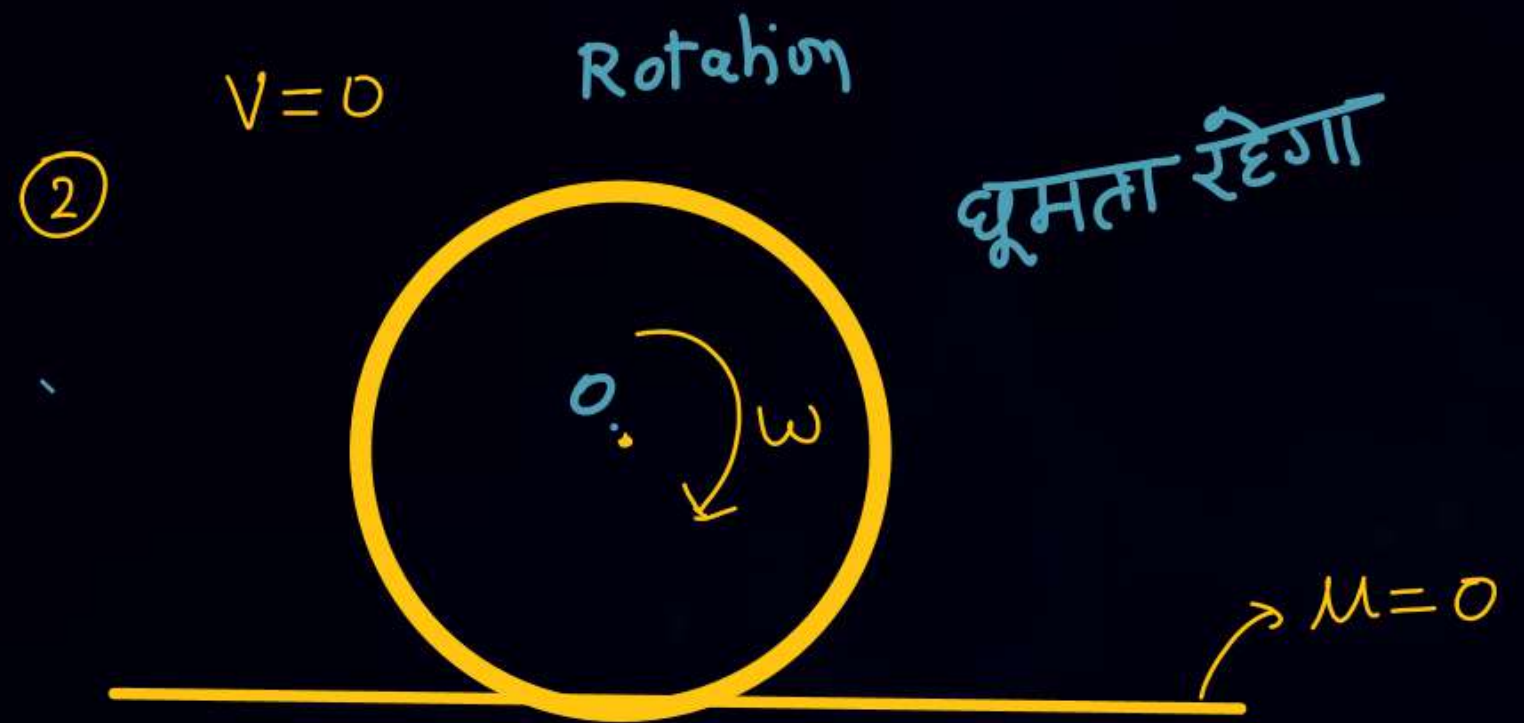
2

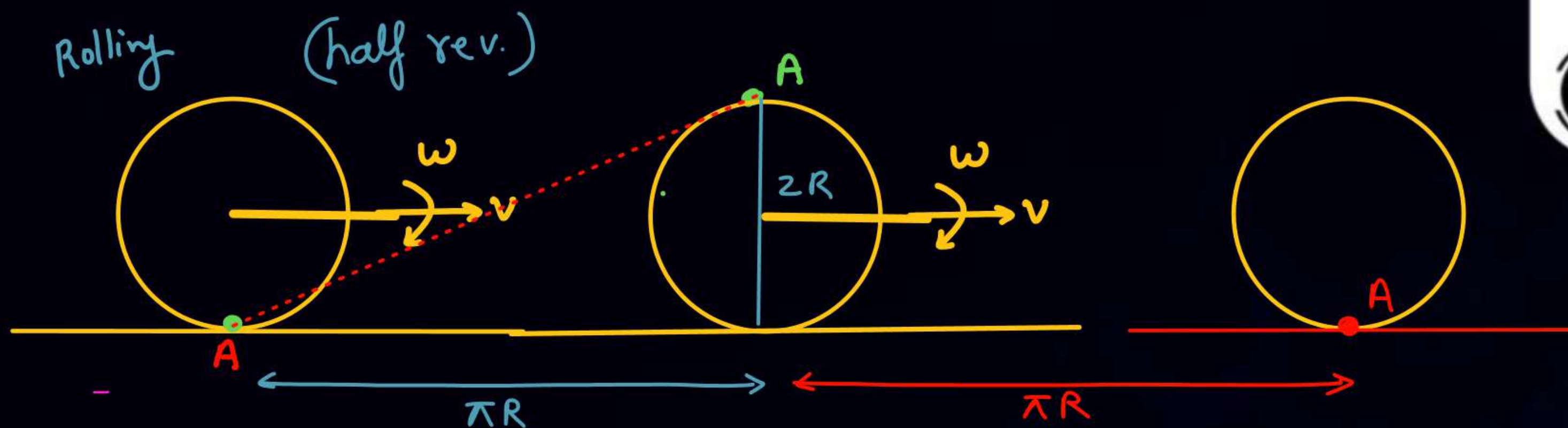


① $\omega=0$ (Rotation) में पड़ेगे



$$x = vt$$





$$\text{Displ.} = \sqrt{(\pi R)^2 + (2R)^2} = R\sqrt{\pi^2 + 4}$$

Complete Rev. \equiv $\text{Disp.} = 2\pi R$

- 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 ms^{-1}

(2) 25 ms^{-1}

(3) 20 ms^{-1}

(4) 8 ms^{-1}

11. A particle moves along a straight line OX . At a time t (in seconds) the distance x (in metres) of the particle from O is given by $x = 40 + 12t - t^3$. How long would the particle travel before coming to rest?

[2006]

(1) 16 m

(2) 24 m

(3) 40 m

(4) 56 m

1. The numerical ratio of distance to displacement is:

- (1) Always equal to one (2) Always less than one
(3) Always greater than one (4) Equal to or more than one

(Yakeen NEET Physics M-1)

2. A wheel of radius 3 m rolls forward half a revolution on a horizontal ground. The magnitude of the displacement of the point of the wheel initially in contact with the ground is:

- (1) 2π m (2) $\sqrt{2}\pi$ m
(3) $\sqrt{\pi^2 + 4}$ m (4) $3\sqrt{\pi^2 + 4}$ m

(Yakeen NEET Physics M-1)

Q

$$x = \frac{t^3}{3} - 3t^2 + 9t + 10$$

turning point

$$t = 3$$

$$v = t^2 - 6t + 9 = 0$$

QUESTION



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 ms^{-1}

2 25 ms^{-1}

3 20 ms^{-1}

4 8 ms^{-1}

Ans : (1)

QUESTION



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 ms^{-1}
- 2** 5 ms^{-1}
- 3** 62.5 ms^{-1}
- 4** 12.5 ms^{-1}

Ans : (1)

QUESTION



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 06 ms^{-1}

2 14 ms^{-1}

3 10 ms^{-1}

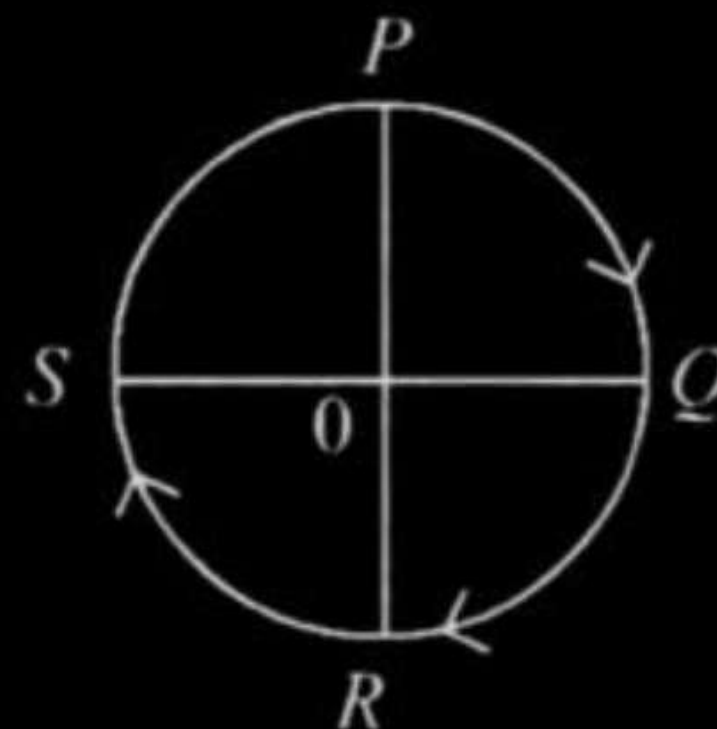
4 16 ms^{-1}

Ans : (4)

QUESTION

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 April 2024 - Shift 2]**

- 1 $\sqrt{8}$ km
- 2 8 km
- 3 6 km
- 4 4 km



Homework

- KPP 13 \rightarrow only \Rightarrow 7, 14, (1-8), (15-22)
32, 34, 36, 42, 45,
- DPP - 01
- Revise vector please... (components, etc)



THANK
YOU