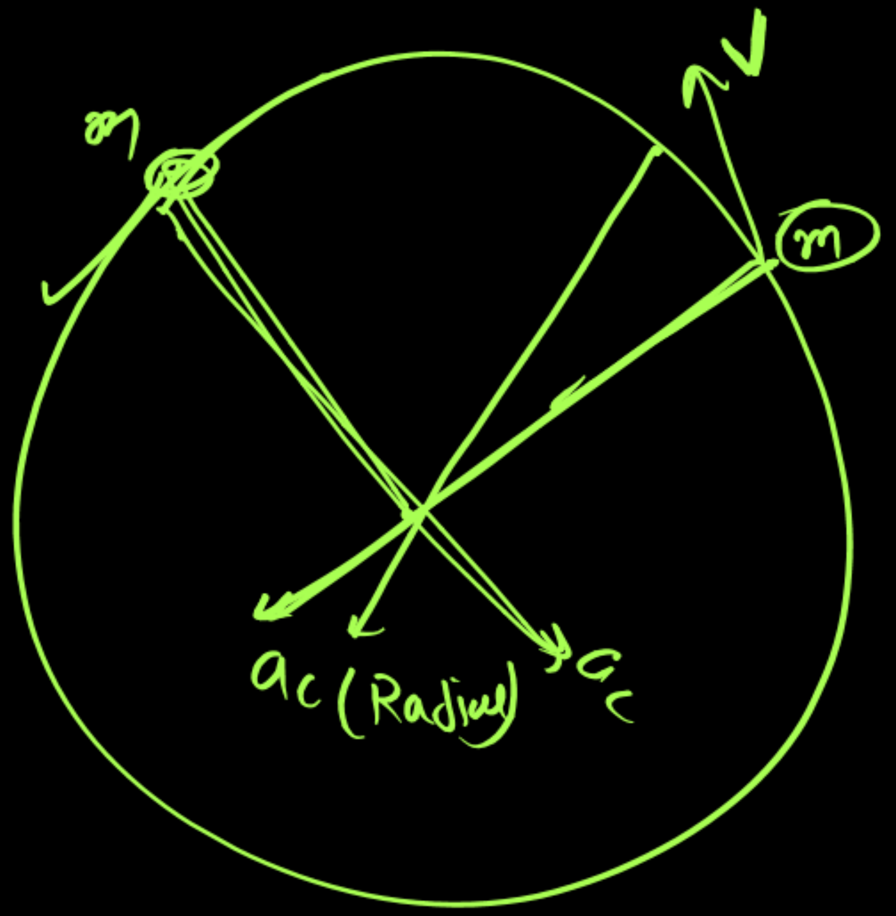
Play with PHYSICS in MR Style

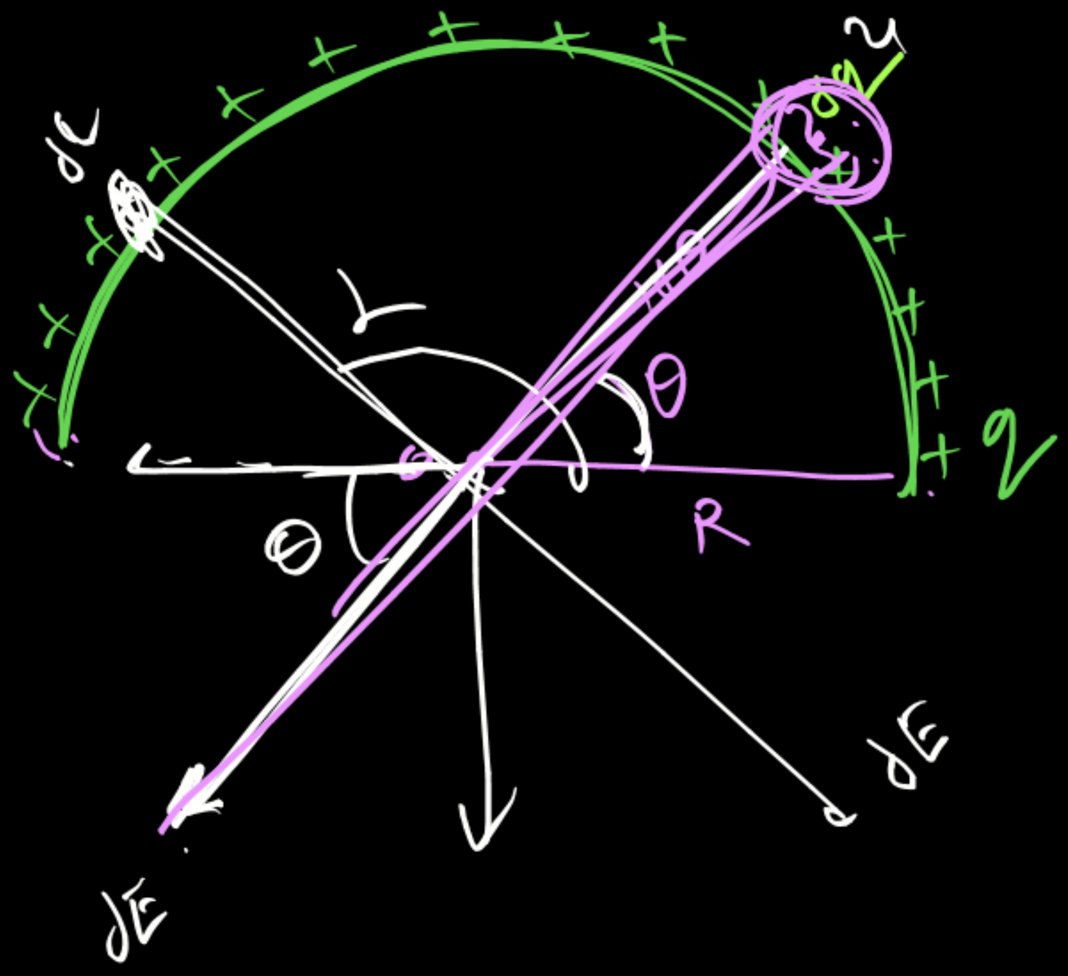
Lecture-03

By - Manish Raj (MR Sir)

Topics to be covered

1. Circular arc
2.
3.
4.





Gravitat.

M.E.C

mom (Fmg)

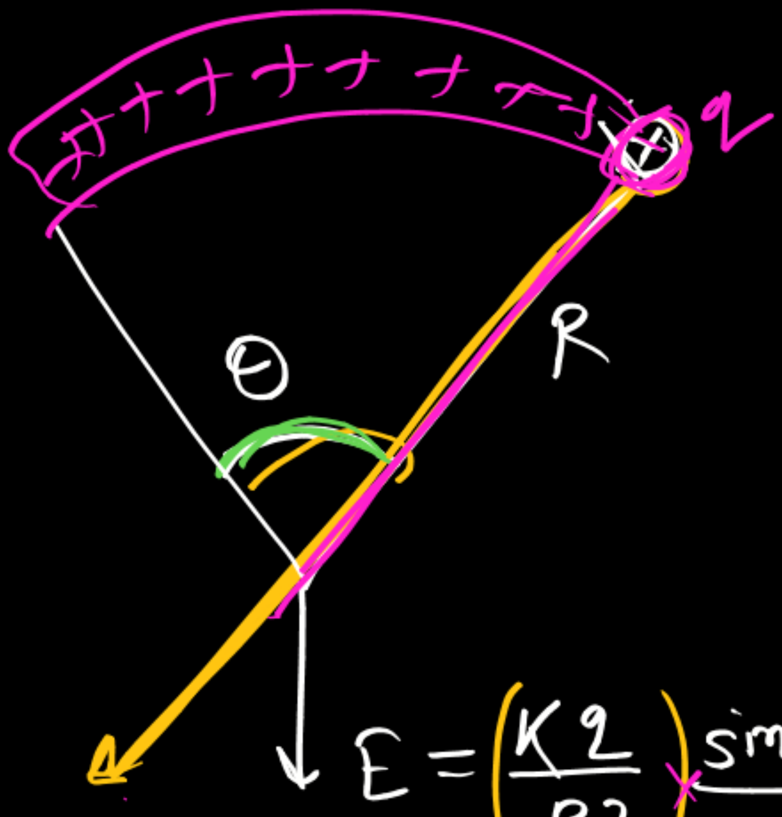
Kinet (a_c) m

N.L.M. (F_c) ma

C-O-M

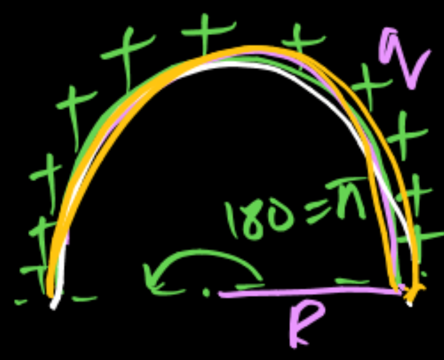
$$E = \frac{Kq}{R^2} \frac{\sin(\theta/2)}{(\theta/2)}$$ ✓

$\boxed{\theta \rightarrow \text{Arc Angle}}$



$$E = \left(\frac{Kq}{R^2}\right)\frac{\sin(\theta/2)}{\theta/2}$$

half Ring.



line charge density $\lambda = \frac{q}{\pi R}$

$\boxed{q = \pi R \lambda}$

$$E = \frac{Kq}{R^2}\,\frac{\sin(\pi/2)}{\pi/2} = \left(\frac{2Kq}{\pi R^2}\right)$$ Half Rg

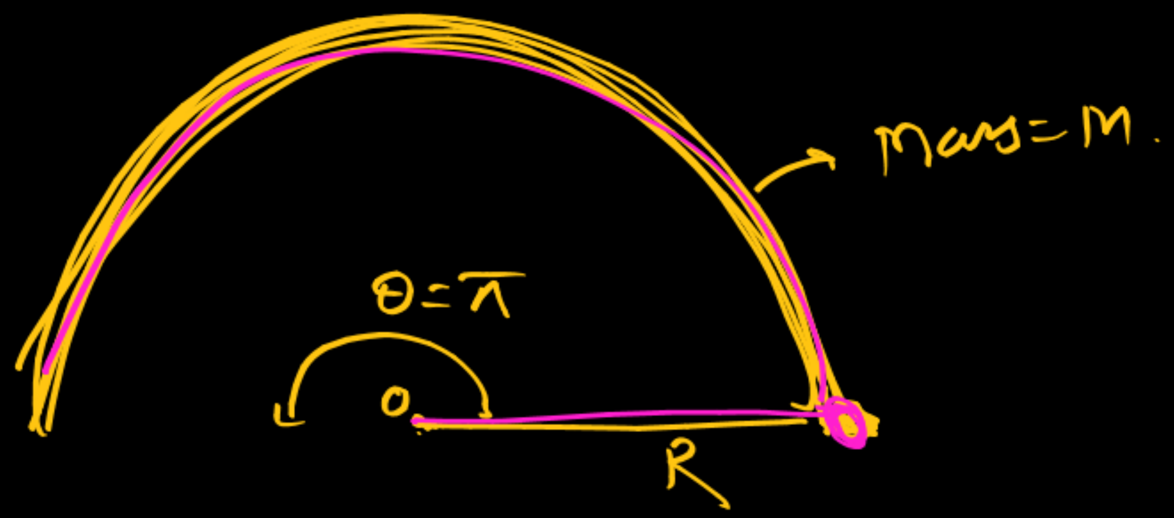
Putting value of (q)

$$E = \frac{2K\cancel{\pi}\cancel{R}\lambda}{\cancel{\pi}\cancel{R^2}\,R}$$

$$\boxed{E = \frac{2K\lambda}{R}}$$

due to half Rg.

Gravitation field

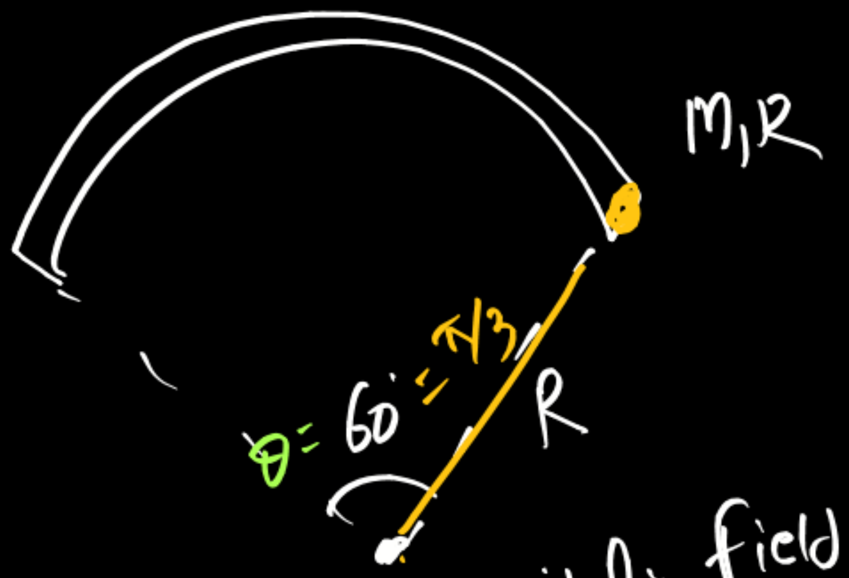


Gravitation field at centre

$$I_{Arc} = \frac{GM}{R^2}\,\frac{\sin(\theta/2)}{\theta/2}$$

θ = Arc Angle

$$I_{Semi\text{-}circle} = \frac{GM}{R^2}\,\frac{\sin \pi/2}{\pi/2} = \frac{2GM}{\pi R^2}$$



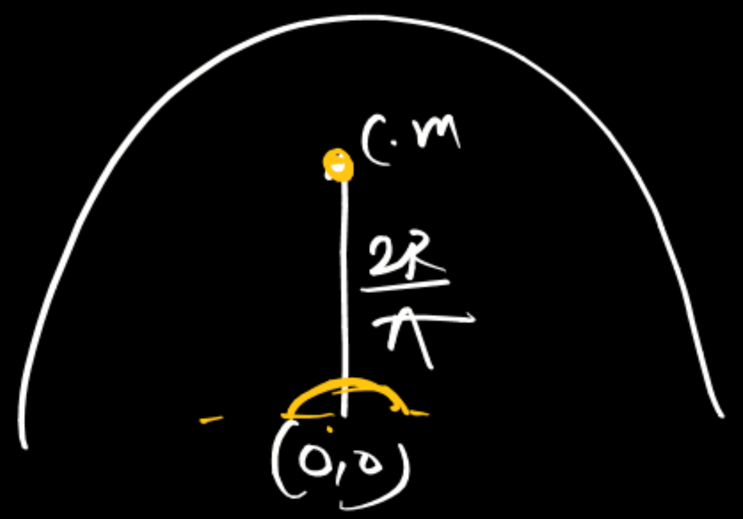
I gravitational field

$$I = \frac{GM}{R^2}\,\frac{\sin\frac{\pi}{3\times 2}}{\pi/6}$$

$$= \frac{GM}{R^2} \times \frac{\sin(\pi/6)}{\pi/6}$$

$$= \frac{6GM}{\pi R^2} \times \frac{1}{2} = \left(\frac{3GM}{\pi R^2}\right)$$

C.O.M. of circular Arc.



$$Y_{c.m} = R \times \frac{\sin(\theta/2)}{\theta/2}$$

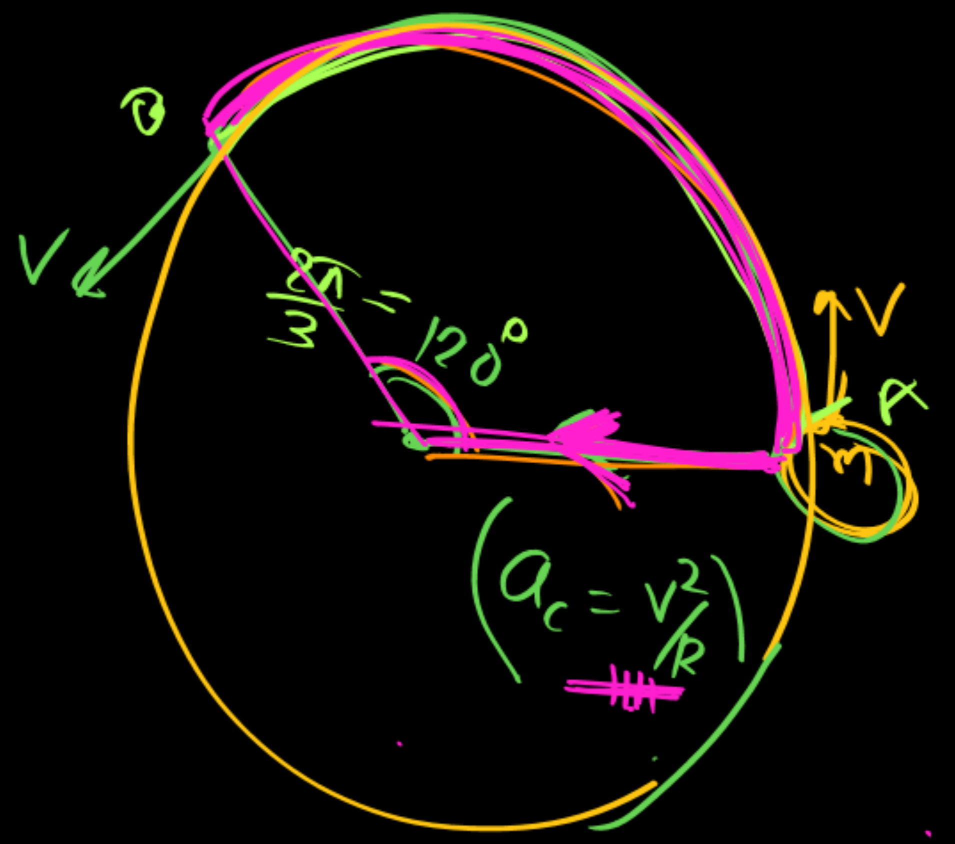
$$Y_{\text{semicircle}} = \frac{\sin\left(\cancel{\frac{180}{2}}^{\,90^\circ}\right)}{\pi/2}$$

Ring $= \frac{2R}{\pi}$

Question

Object is moving on circular path with uniform speed v, then find its average acceleration when it rotated by angle 120°.

at an instant centripetal accⁿ $= v^2/R$.

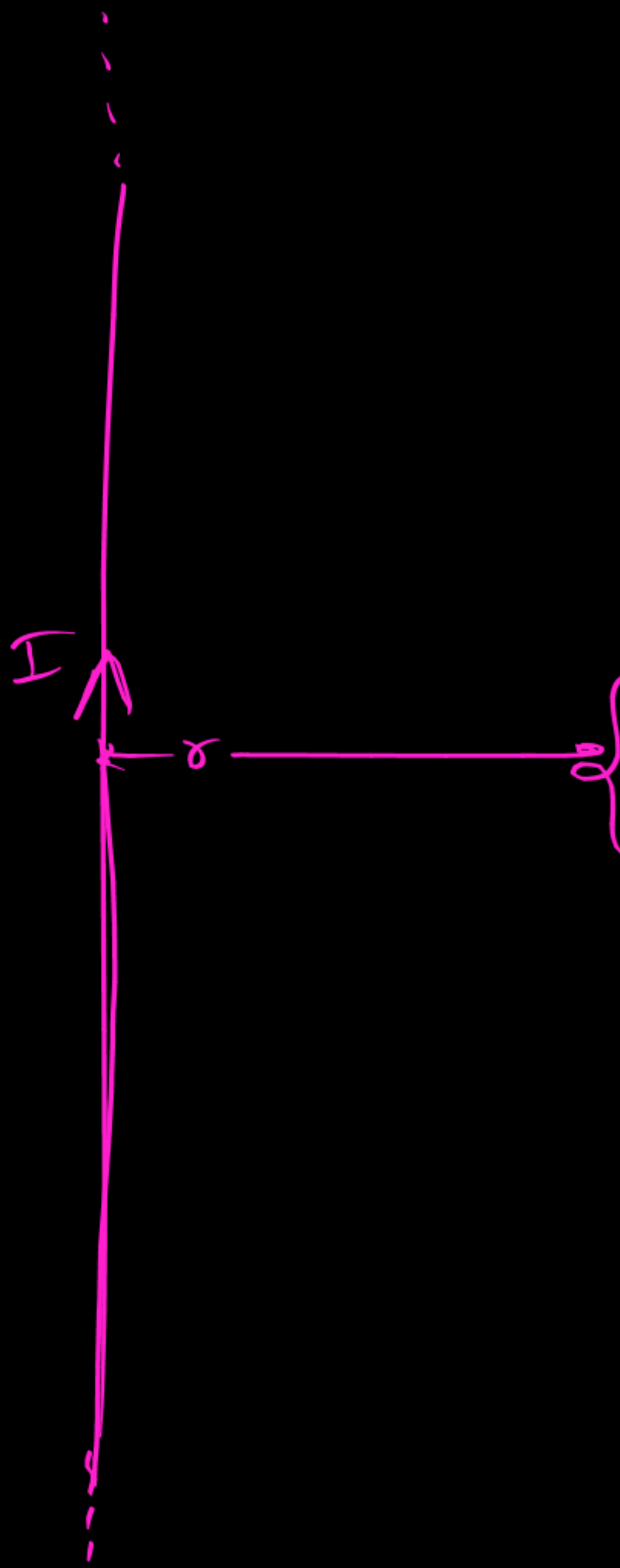


avg. centripetal accⁿ on Arc of 'θ' $= \frac{v^2}{R} \times \frac{\sin(\theta/2)}{\theta/2}$

$= \frac{v^2}{R} \frac{\sin\left(\frac{2\pi}{3\times 2}\right)}{\frac{2\pi}{3\times 2}}$

$= \frac{v^2}{R} \times \frac{\sin(\pi/3)}{\pi/3}$

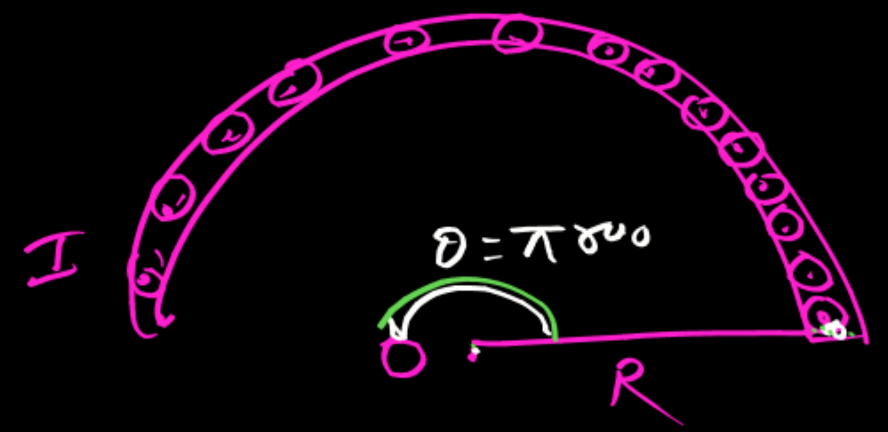
$= \frac{3v^2\sqrt{3}}{R\pi 2} = \frac{3\sqrt{3}v^2}{2\pi R}$

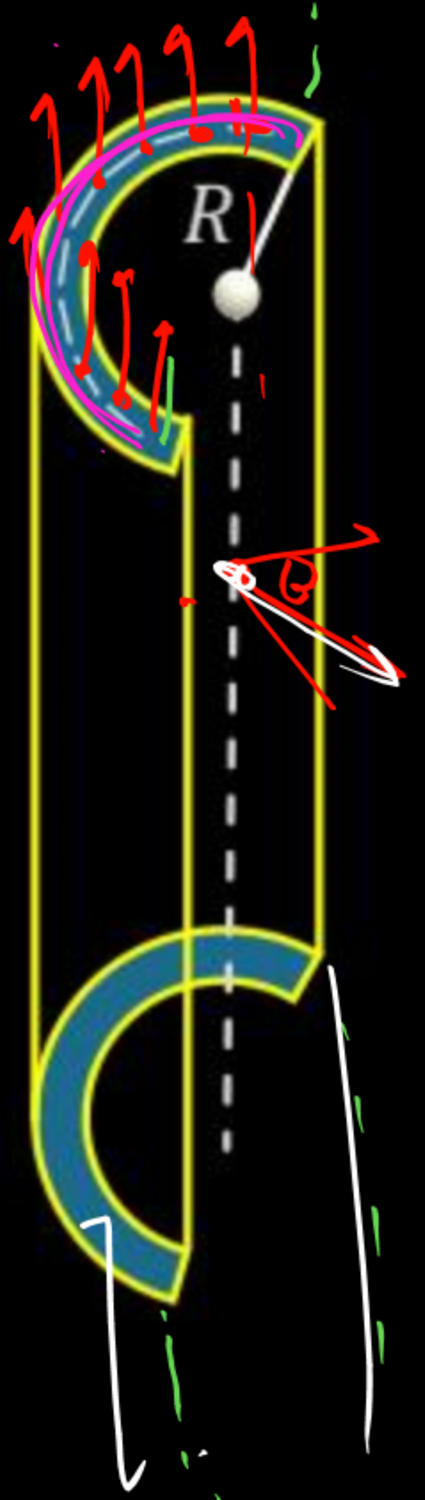


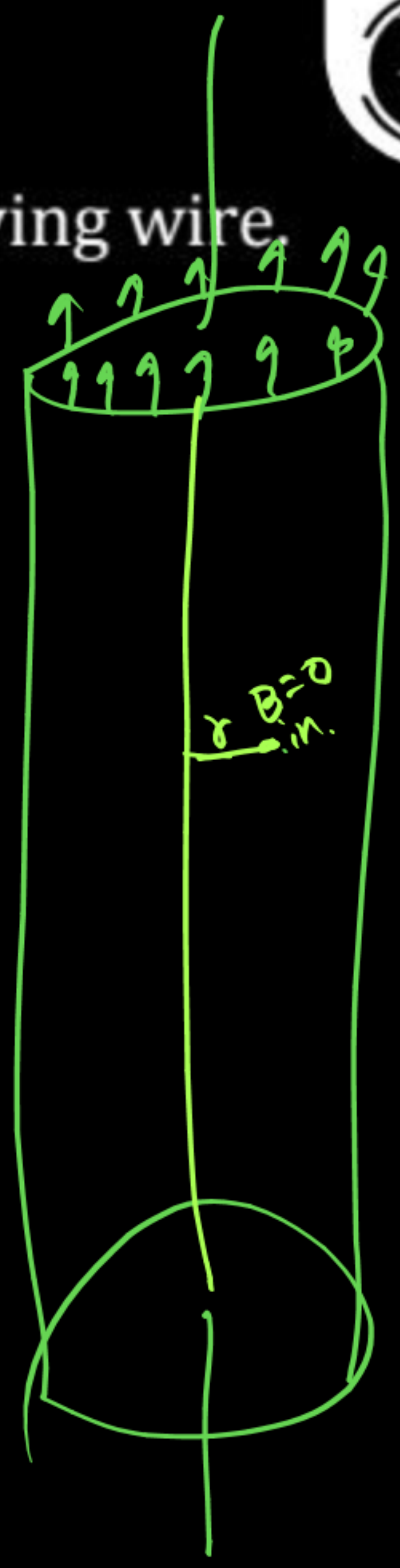
$$\left\{ B = \frac{\mu_0 I}{2\pi r} \right\}$$

Question

Magnetic field on the axis of a (Infinite) long hollow semicylindrical current carrying wire.



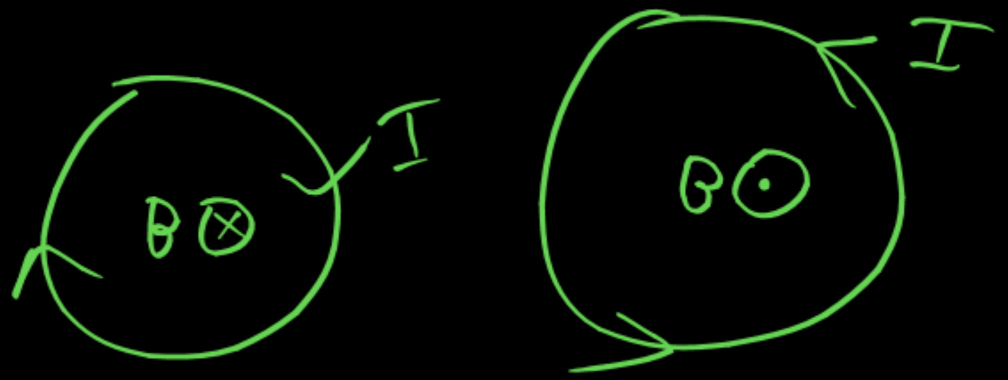




$$B = \left(\frac{\mu_0 I}{2\pi R}\right) \times \frac{\sin \pi/2}{(\pi/2)}$$

$$B = \frac{\mu_0 I \times \cancel{2}}{\cancel{2}\pi R(\pi)} = \frac{\mu_0 I}{\pi^2 R}$$ Ans

Ex

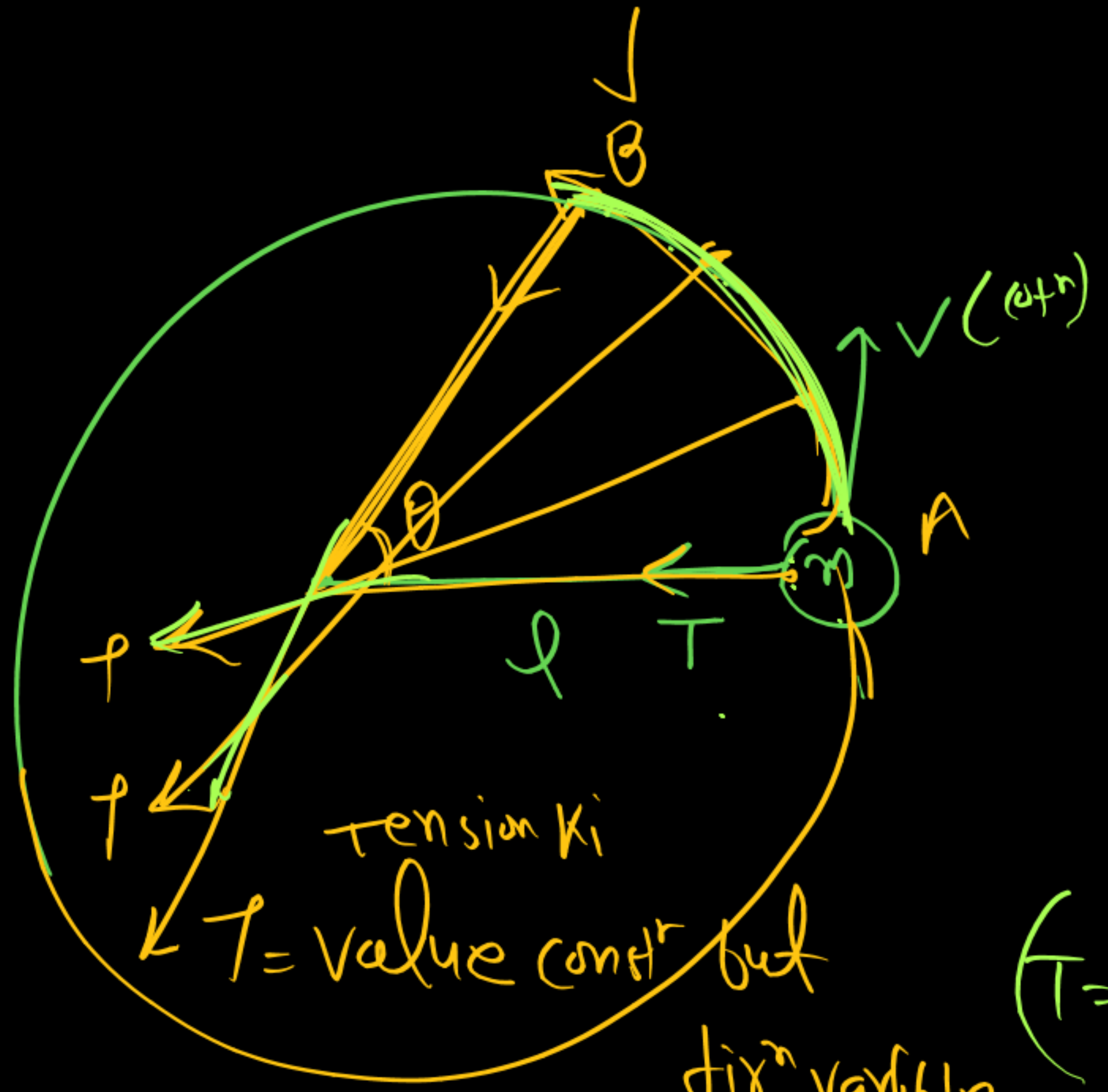


Circular current carrying wire

यहाँ पर Arc Ka mR* नहीं लगेगा

$B = \frac{\mu_0 I}{2R} \odot$

B is not radial



Tension ki T = value const^n but dir^n variable

$\left(T = \frac{mv^2}{R}\right)$ at point

Value (magnitude) of Tension is constant

~~Avg Tension force = T~~ wrong

Avg Tension force $= T\,\frac{\sin\theta/2}{\theta/2}$

Avg centripetal force $= \frac{mv^2}{R}\left(\frac{\sin\theta/2}{\theta/2}\right)$

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THANK YOU