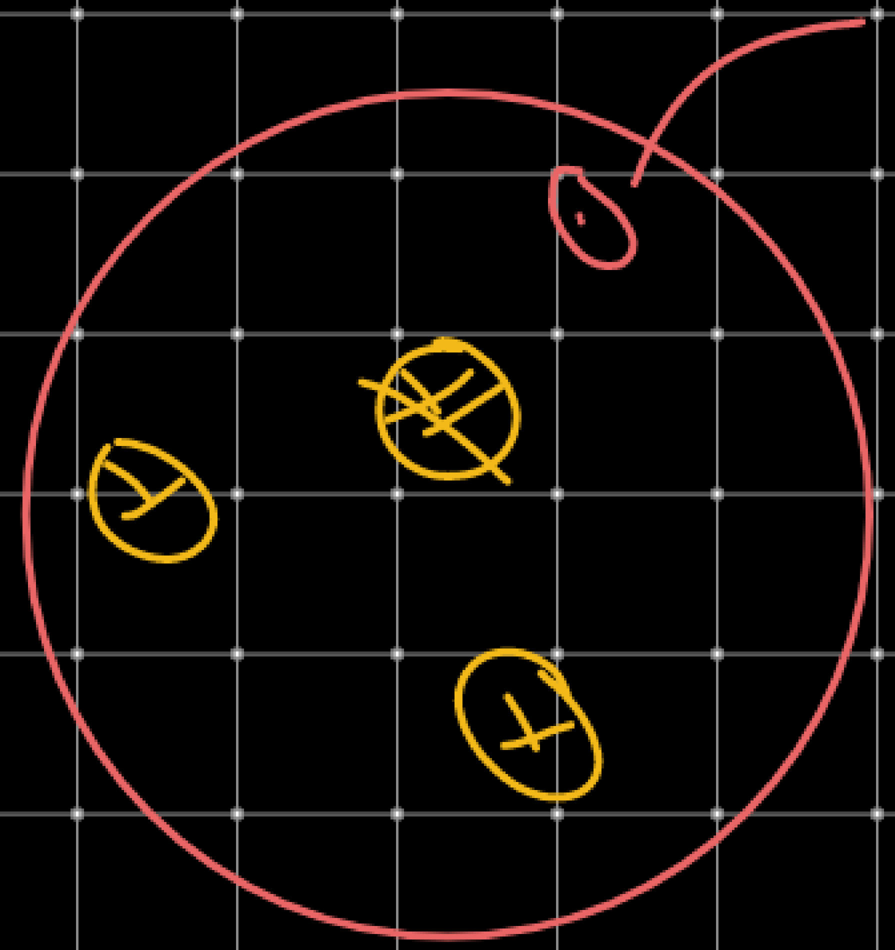
EMI

⇒ dir^n of induced current.

Faraday law (i) Change of flux ⇒ Induced Emf & induced current.

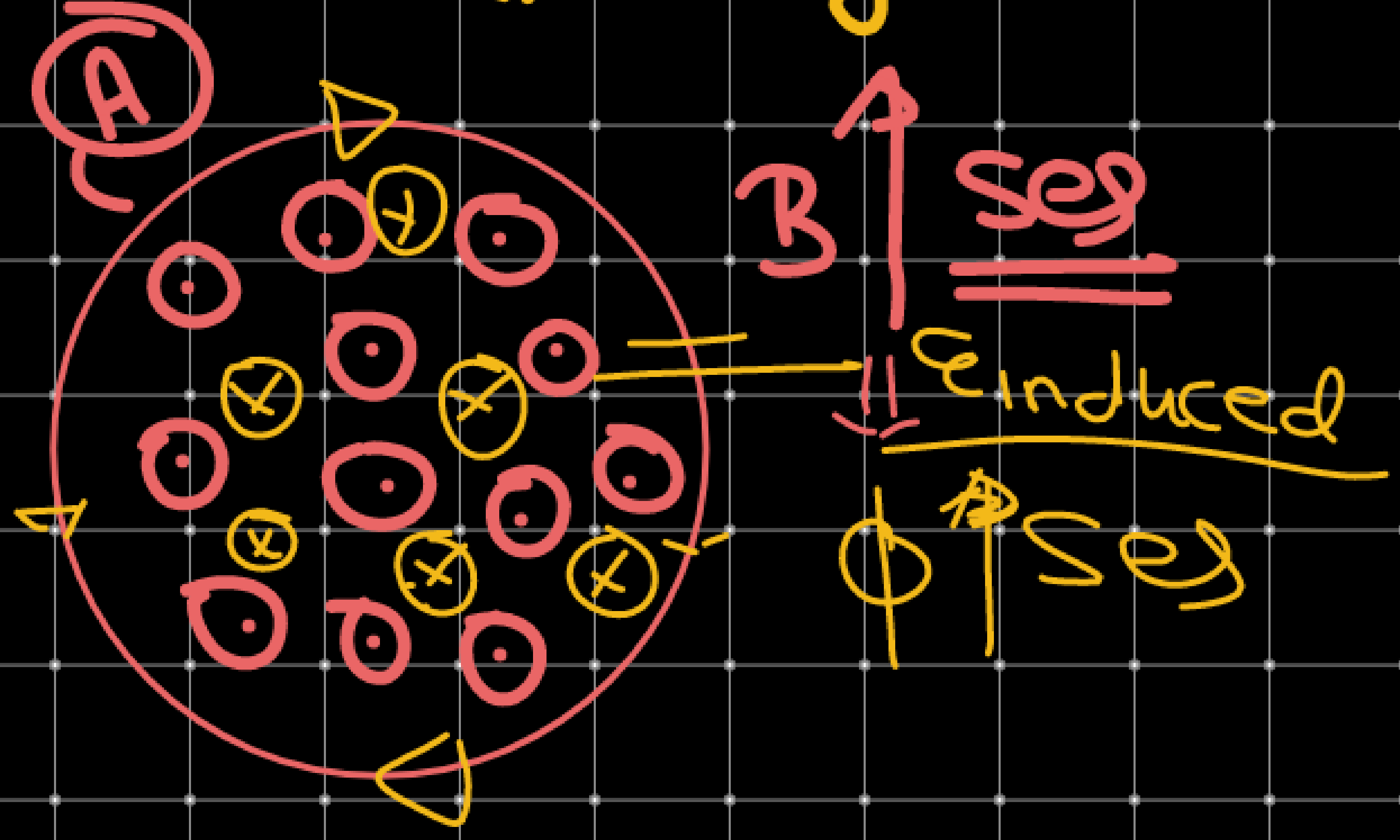
⇒ (ii) $\varepsilon_{ind} = \left|\frac{d\phi}{dt}\right|$

100 MFL ⟶ 200 MFL



⇒ **Lenz :-** $\varepsilon_{ind} = -\frac{d\phi}{dt}$

Q1) Find dir^n of induced current.

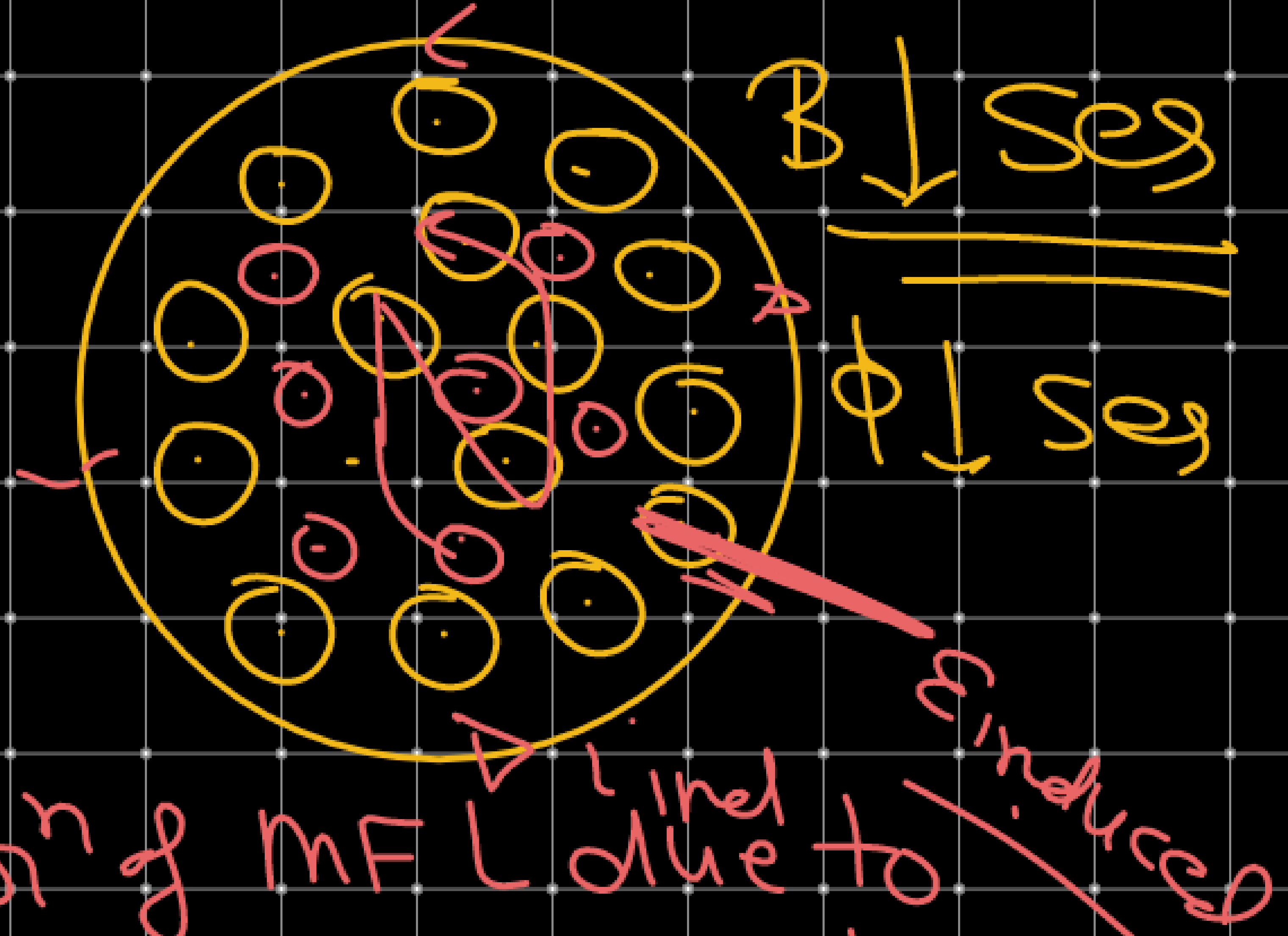


due to induced current MFL inward.

⇒ CW

$i_{induced}$ = CW

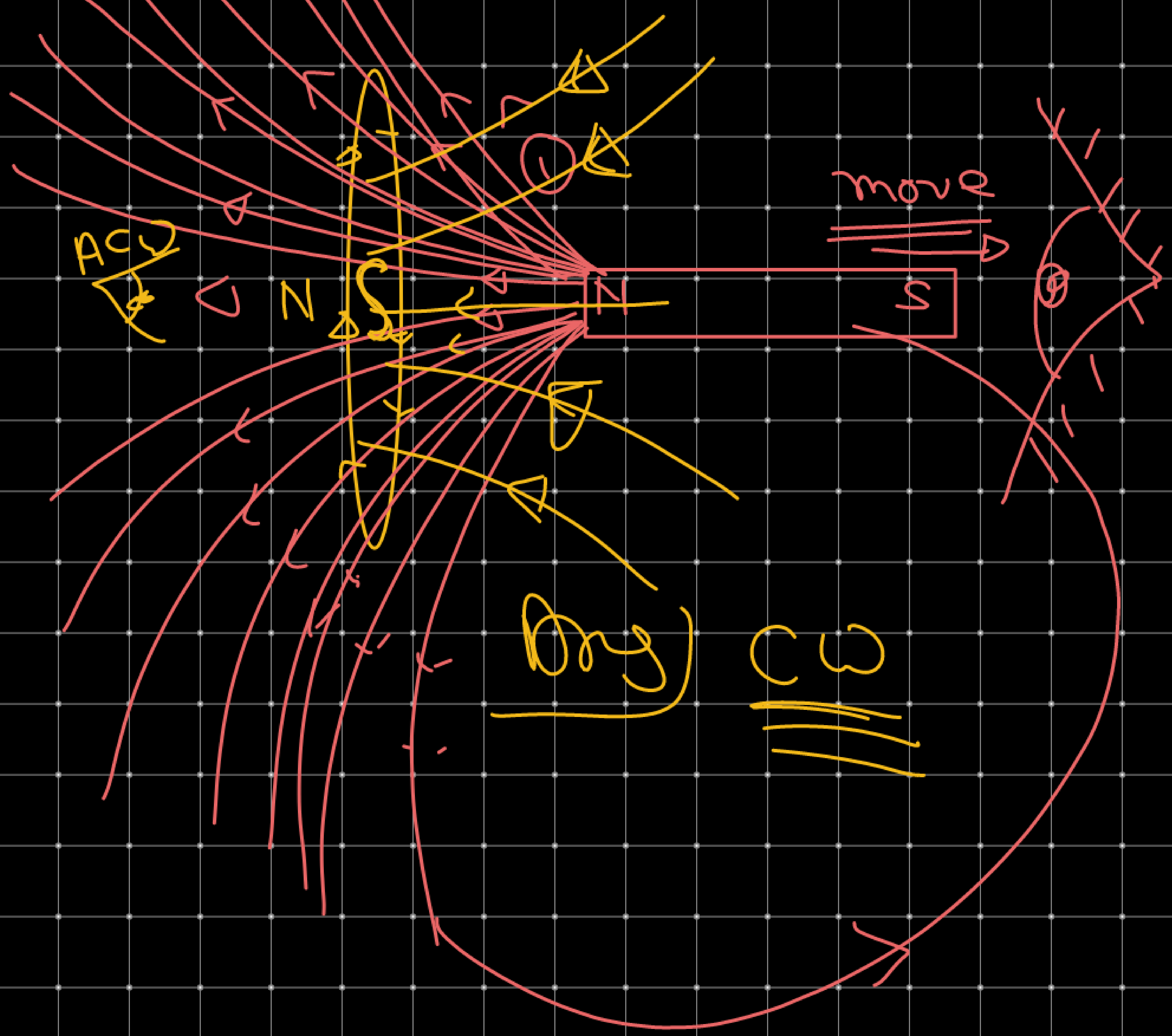
Q2) Find dir^n of induced current



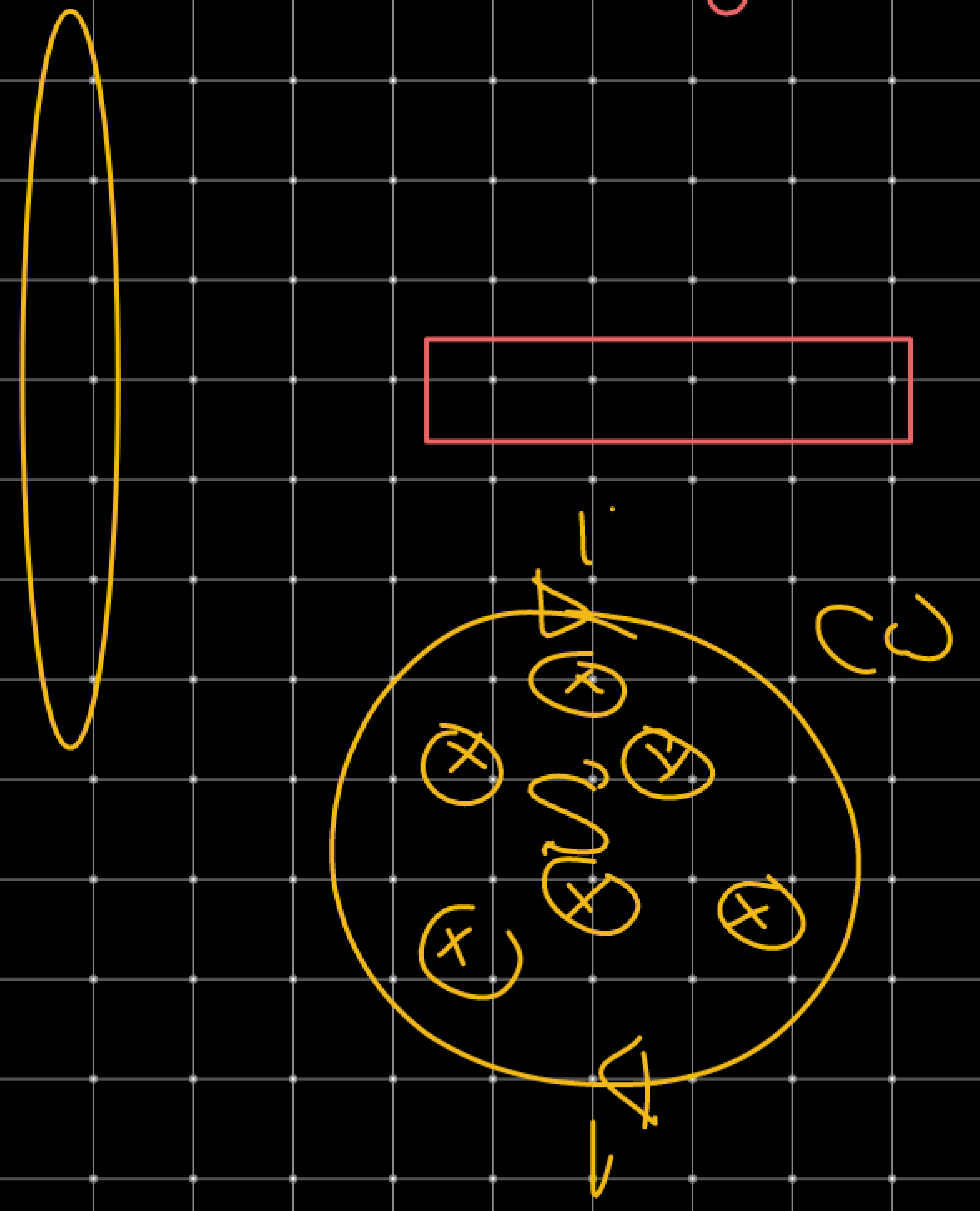
dir^n of MFL due to induced current is outward.

$i_{induced}$ = ACW

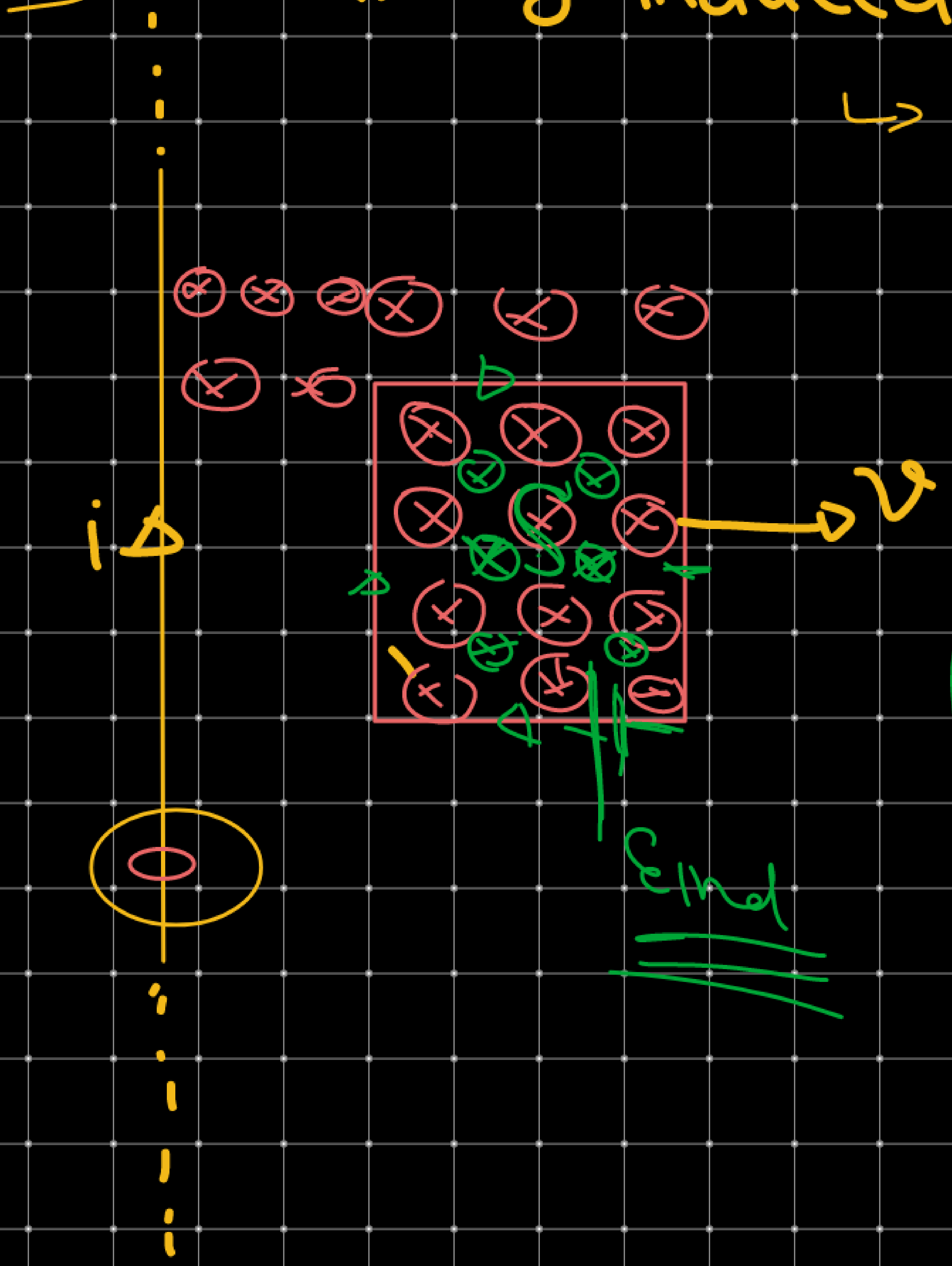
Q) find dirⁿ of induced Emf



Q) find dirⁿ of induced Emf.



Q) find dirn of induced current.



↳ B ↓, $B \propto \frac{1}{r}$

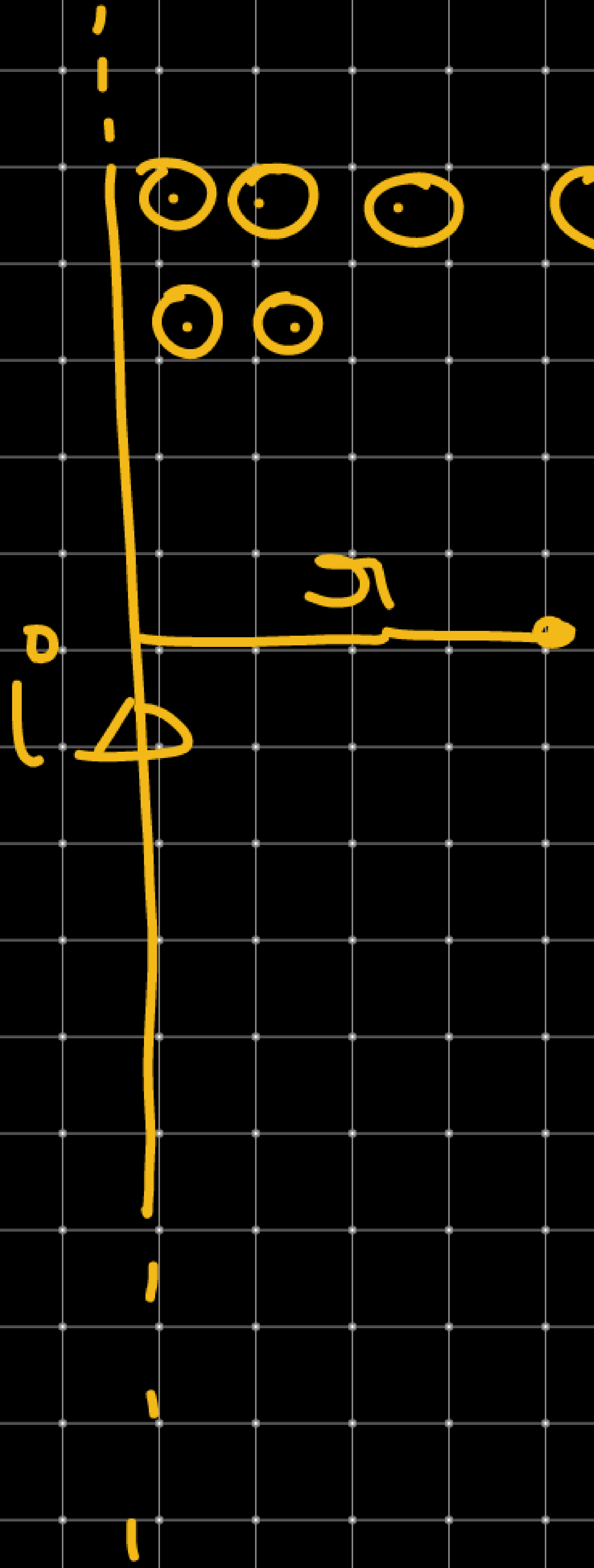
$\phi = BA\cos\theta$

B ↓ Seq.

ϕ ↓ Seq

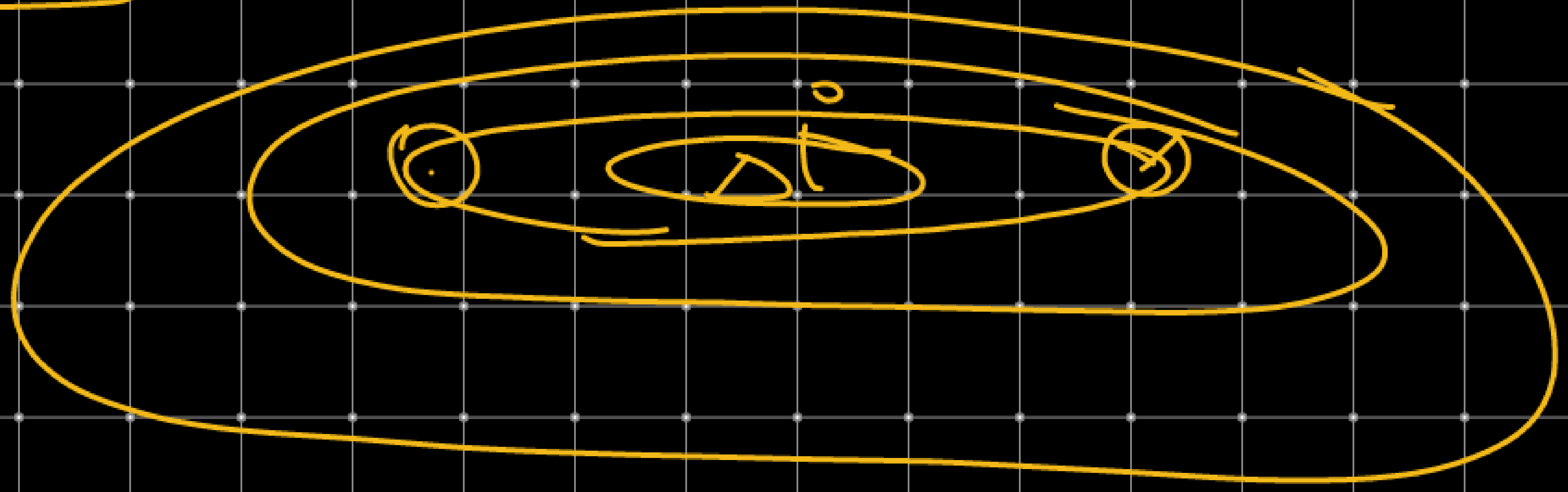
Ans) CW

$i_{induced}$ = C.W

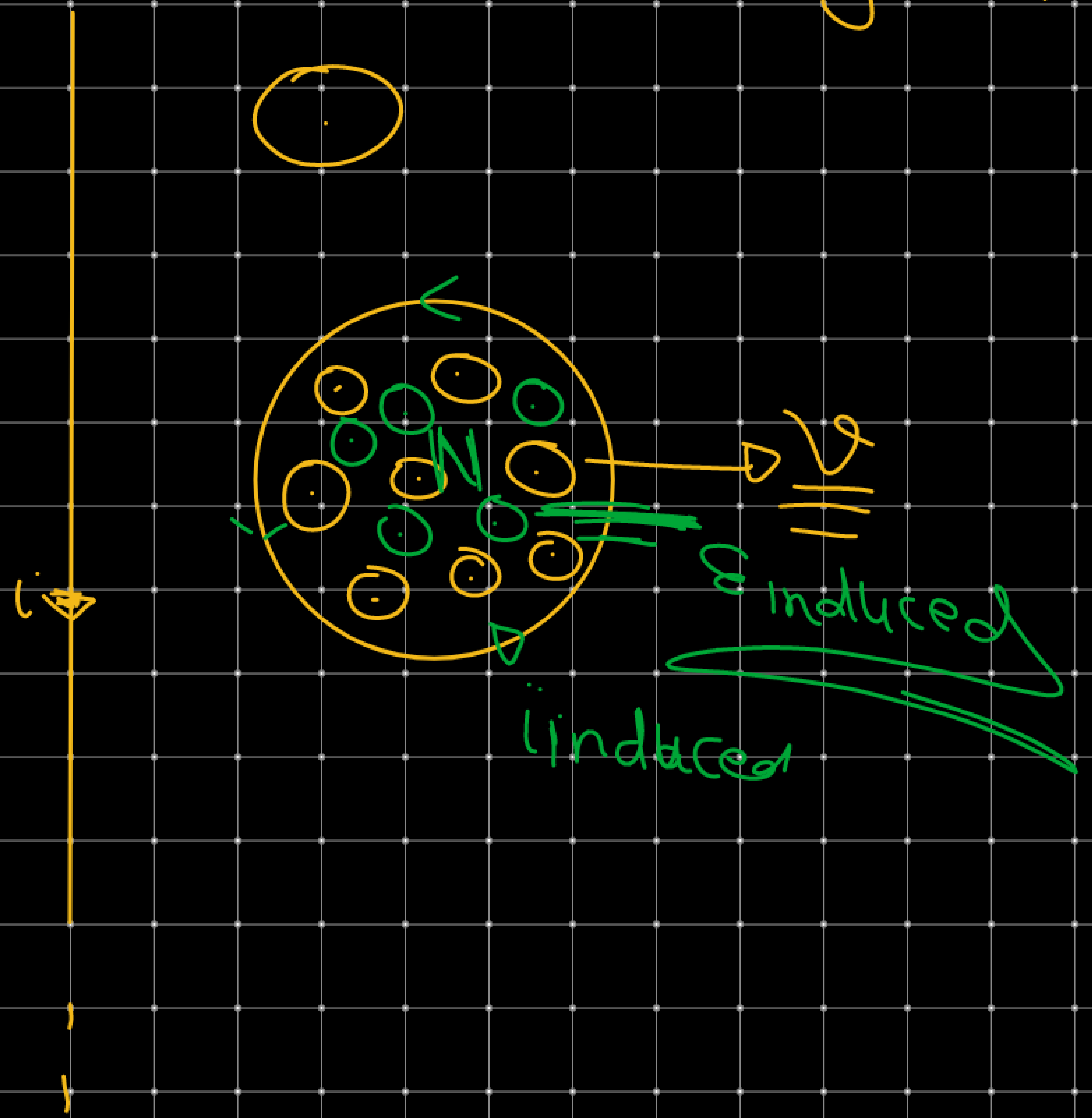


$$B = \frac{\mu_0 i}{2\pi r}$$

$$B \propto \frac{1}{r}$$



find dirn of induced current?



Ans) ACW

(N - N) Pole — repel each other.

(S - S) Pole → " " "

N - S
S - N → Attract to each other.

JEE(M)
AIIMS
NEET

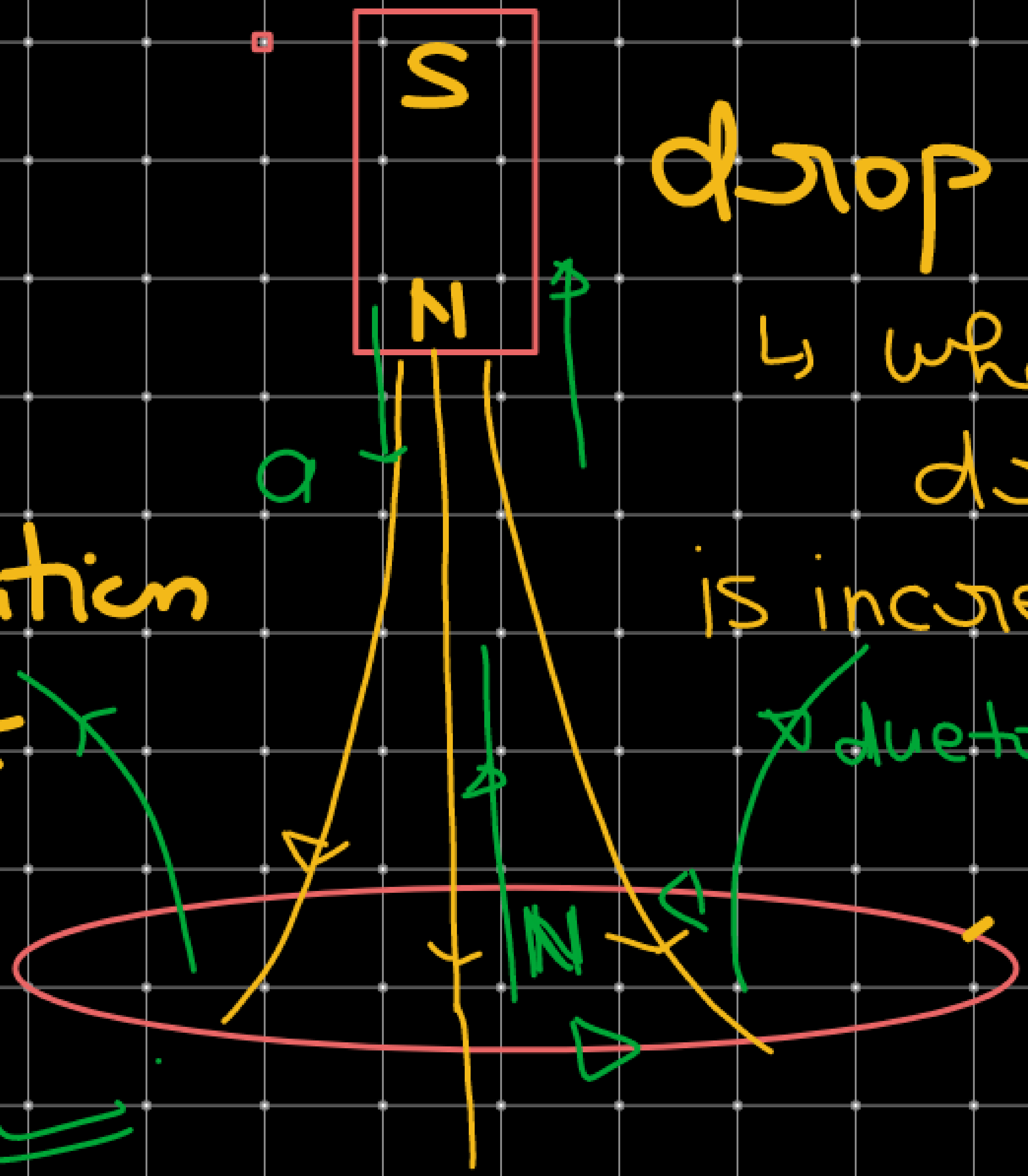
Q) acceleration of magnet

(a) $a > g$

(b) $a < g$

(c) $a = g$

(N) N.O.T.



drop

↳ when Magnet is drop, flux in the coil is increases

due to induced current

ring

fix

$a < g$

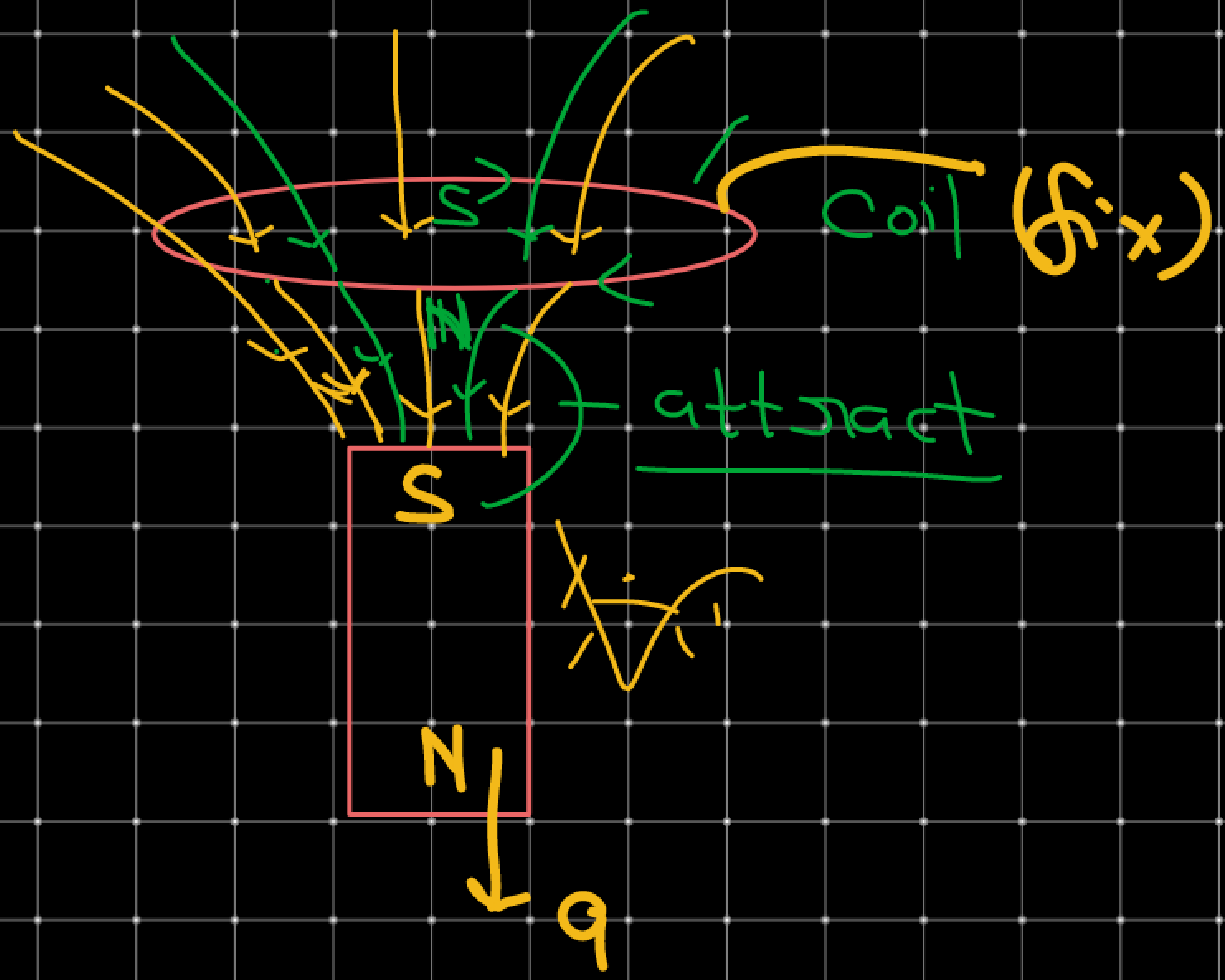
drop

⇒ acceleration

⇓

g

↳ when magnet move downward, magnetic flux ↓ses.



find acceleration of magnet.

(a) $a > g$

(b) $a < g$

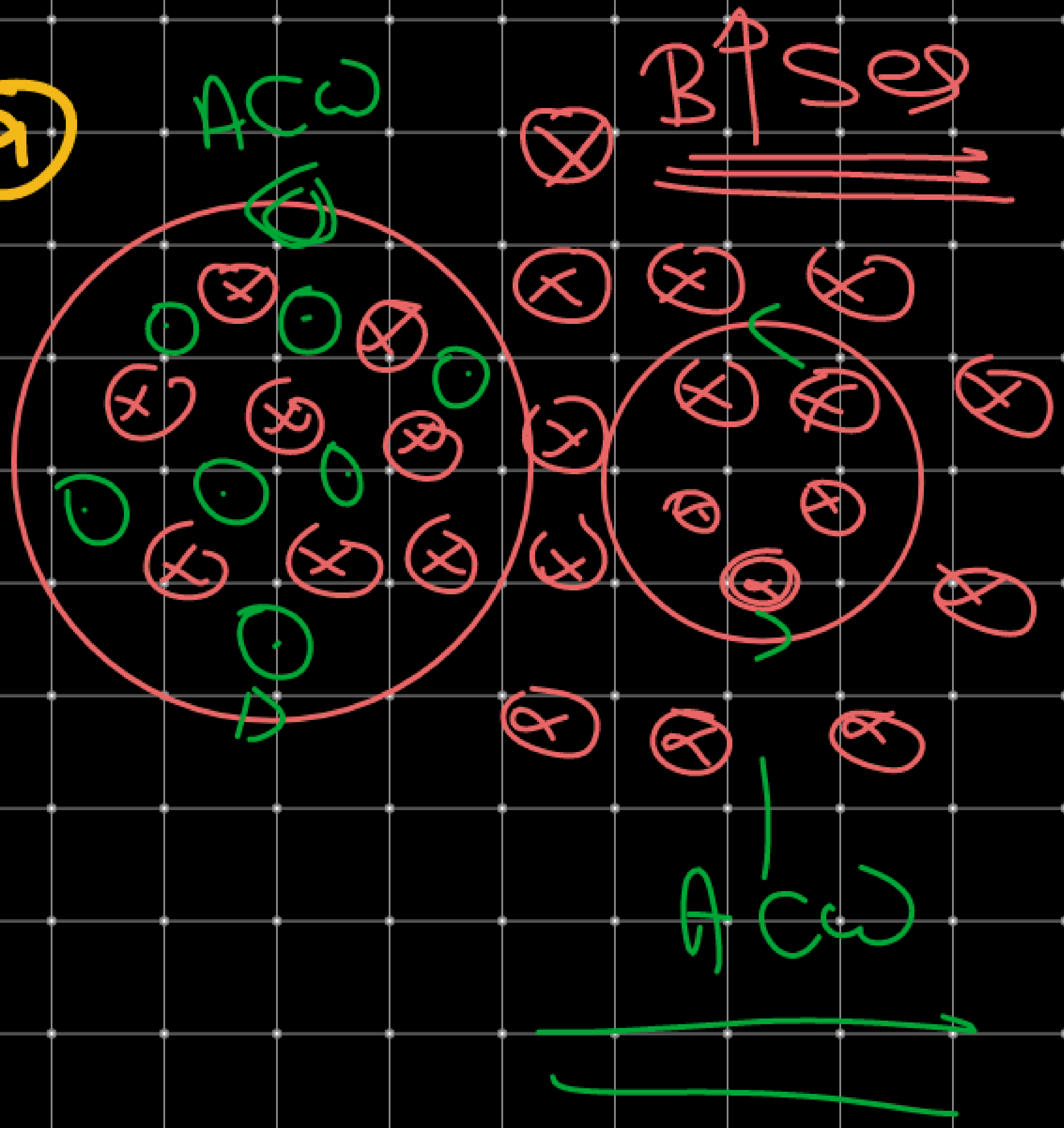
(c) $a = g$

(d) N.O.T.

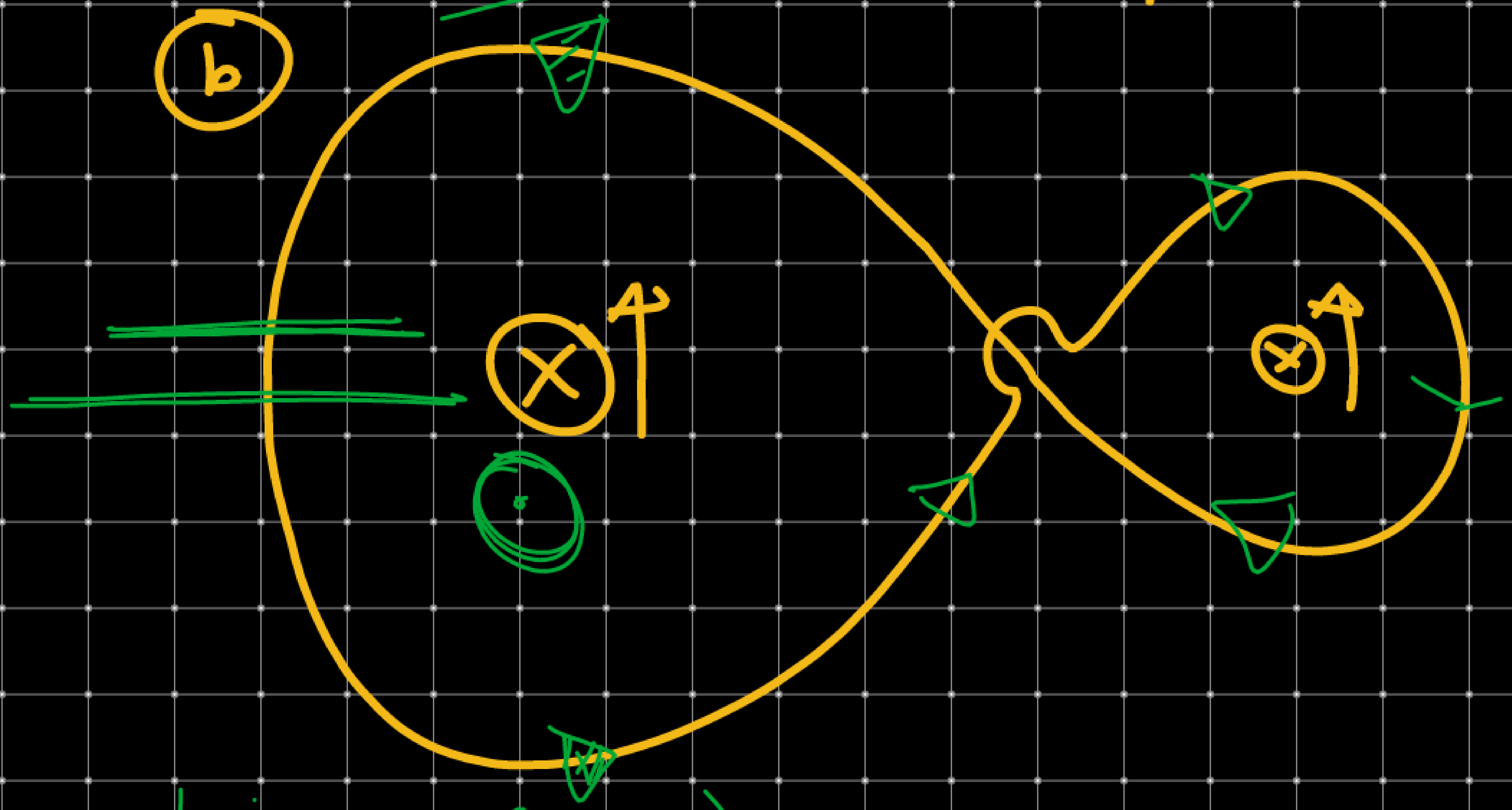
9) Find dirⁿ of induced current. gmp

B ⊗ ↑ ses

(a)



(b)



big → ACW

Small → CW

$$\varepsilon_{induced} = -\frac{d\phi}{dt}$$

$(-)$ — sign.

$$i_{induced} = \frac{\varepsilon_{ind}}{R} = -\frac{1}{R}\frac{d\phi}{dt}$$

$$q_{flow} = i\,dt = \left|\frac{d\phi}{R}\right|$$

$$\varepsilon_{ind} \propto \frac{1}{t}$$

$$i \propto \frac{1}{t}$$

$$q \propto t^0$$

Q1) flux linked with a coil is $\phi = 6t^2 - 5t + 1$. find induced emf at $t = 1$ sec & $t = \frac{1}{2}$ sec.

$$\varepsilon_{ind} = -\frac{d\phi}{dt} = -\frac{d}{dt}(6t^2 - 5t + 1)$$

$$= -[12t - 5]$$

$$\varepsilon_{ind} = -12t + 5$$

$t = 1$ sec, $\varepsilon_{ind} = -12 \times 1 + 5 = -7$ Volt.

$t = \frac{1}{2}$

$$\varepsilon_{ind} = -12 \times \frac{1}{2} + 5$$

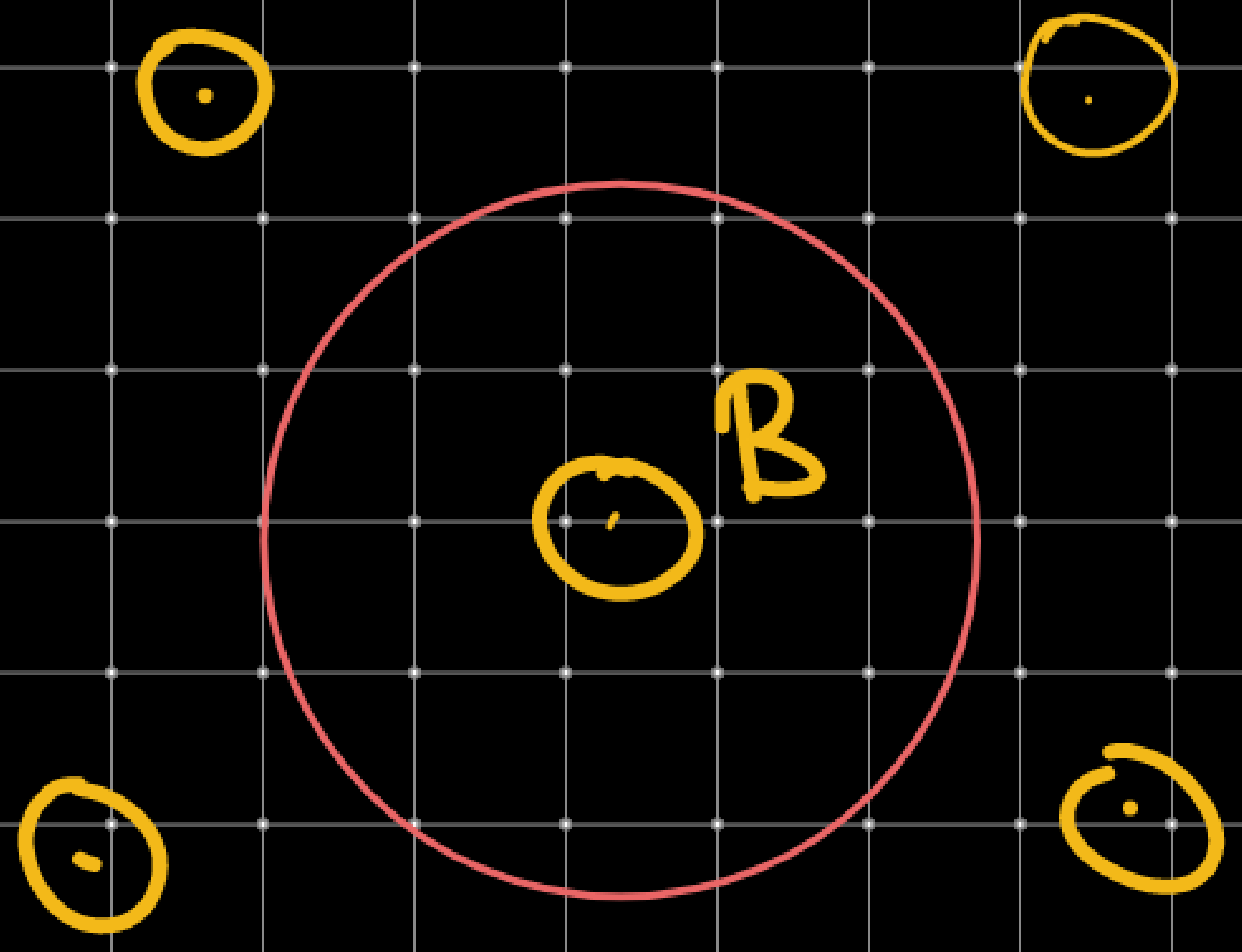
$$= -6 + 5$$

$$= -1 \text{ Volt}$$

AIPMT

Radius of a circular loop is shrinking at rate of 1mm/sec. When loop is placed in uniform transverse magnetic field B=2T. Then find magnitude induced emf when radius is 2cm

Sol)



$\rightarrow B = 2T \qquad \frac{dR}{dt} = -1\times10^{-3}\ m/s$

$A = \pi R^2$

$\phi = B\alpha\pi R^2 = 2\pi R^2$

$\mathcal{E}_{ind} = -\frac{d\phi}{dt} = -\frac{d}{dt}(2\pi R^2)$

$= -2\pi \frac{d}{dt}R^2 = -2\pi\left(2R\frac{dR}{dt}\right)$

$= -4\pi R\frac{dR}{dt}$

$\mathcal{E}_{ind} = -4\pi R \times (-1\times10^{-3})$

$= 4\pi \times 2\times10^{-2} \times 10^{-3}$

$= 8\pi \times 10^{-5}$ Volt

Q) A 800 turn coil of effective area $0.05 m^2$ is kept ⊥ to a magnetic field 5×10^{-5} T. When the plane of the coil is rotate by 90° in 0.1 sec.

$\varepsilon_{ind} = ?$

(a) 2V

(b) 0.02V

(c) 2×10^{-3} V

(d) 0.2V

$$\frac{dR^2}{dt} = 2R^{2-1} \times \frac{dR}{dt}$$

$$\frac{dR^2}{dR} = 2R^{2-1} \times \frac{dR}{dR}$$

$$= 2R$$