$$\varepsilon_{ind} = NBA\omega \sin \omega t$$

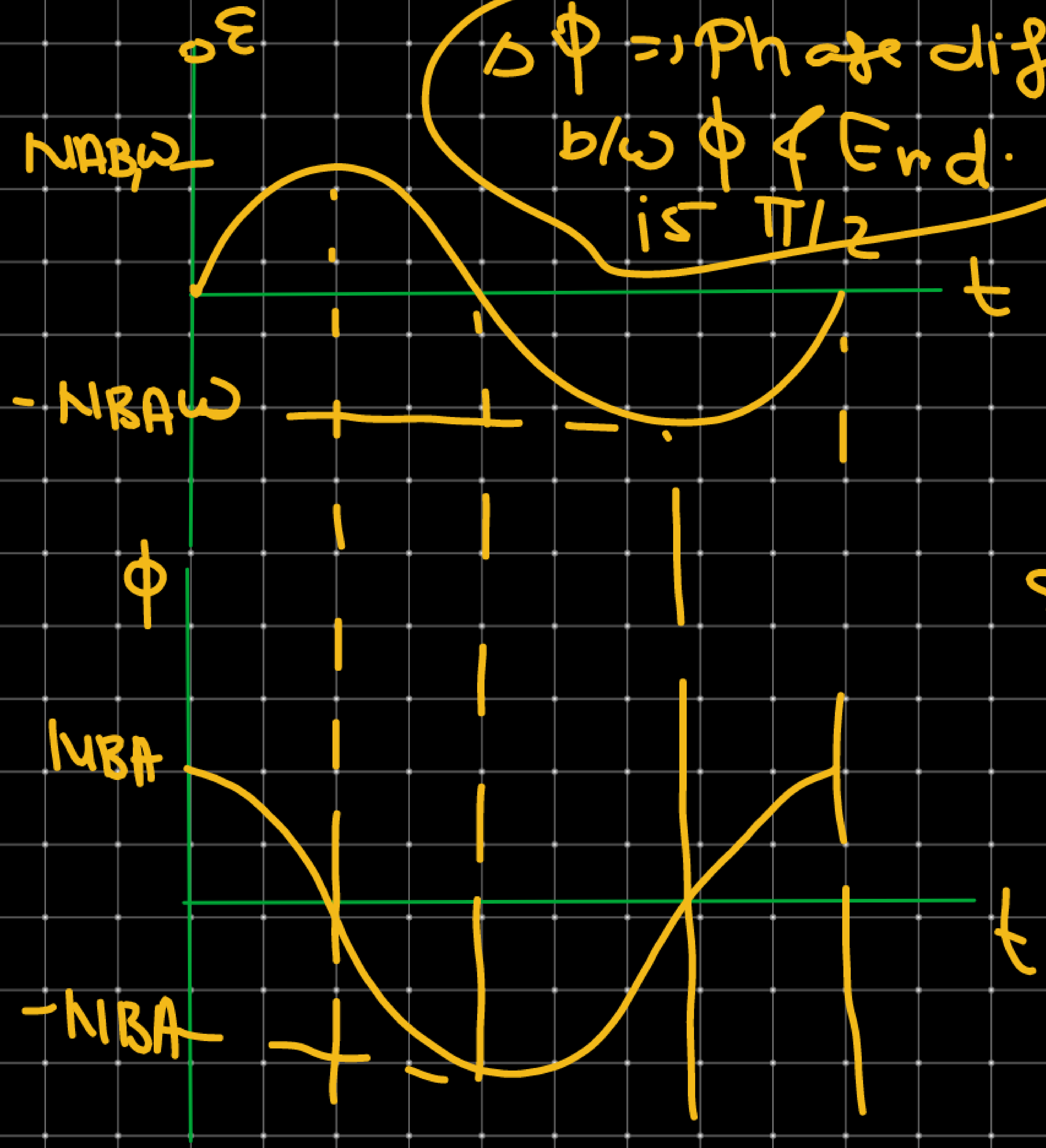
$$\phi = NBA \cos \omega t$$

$$\sin\left(\frac{\pi}{2} - \omega t\right) = \cos \omega t$$

$$\phi = NBA \sin\left(\frac{\pi}{2} - \omega t\right)$$

$$\varepsilon_{ind} = NBA\omega \sin \omega t$$

Phase diff b/w ε_{ind} & ϕ =



$\Delta\phi$ = Phase diff b/w ϕ & ε_{nd} is $\pi/2$

$\varepsilon_{nd} = \omega NBA \sin\omega t$

$\phi = NBA\cos\omega t$

$= NBA$

$\cos\omega t =$

$\sin\left(\frac{\pi}{2}+\omega t\right) = \cos\omega t$

$\phi = NBA\sin\left(\frac{\pi}{2}+\omega t\right)$

$\Delta\phi = \left[\left(\frac{\pi}{2}+\omega t\right) - (\omega t)\right]$

$\boxed{\Delta\phi = \pi/2}$

Phase of Eind Emf leg $\frac{\pi}{2}$ with flux

Q2) Dynamo is based on the principle of

(a) EMI (electromagnetic induction) (c) induced magnetism

(b) Induced Emf (iv) faraday's effect.

⇒ induced Emf in a coil is given by

$\mathcal{E} = 20 \sin 2\pi t$. find maximum induced Emf at time t = ?

Sol)

$\mathcal{E} = (20 \sin 2\pi t)$ Volt

$\mathcal{E} = NBA\omega \sin \omega t$.

$\mathcal{E}_{max} = 20$ Volt

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

$t = \frac{1}{4}$ second

Q2) $\phi = (20\cos 2\pi t)$ wb find maximum induced Emf.

#

$\phi = 20\cos 2\pi t$

$\phi_G = NBA\cos\omega t$

$\mathcal{E}_{ind} = NBA\omega\sin\omega t$

$(\mathcal{E}_{ind})_{max} = NBA\omega$

$NBA = 20$

$\omega = 2\pi$

$(\mathcal{E}_{ind})_{max} = NBA\omega$

$= 20 \times 2\pi$

$= 40\pi$ Volt

$\phi = 20\cos 2\pi t$

$\mathcal{E}_{ind} = -\frac{d\phi}{dt} = -\frac{d}{dt}(20\cos 2\pi t)$

$= -20\frac{d}{dt}\cos 2\pi t$

$= -20 \times (-\sin 2\pi t)2\pi$

$= +20 \times 2\pi\sin 2\pi t$

$\mathcal{E}_{ind} = 40\pi\sin 2\pi t$

$\mathcal{E}_{ind} = 40\pi$

$q \rightarrow$ rest E

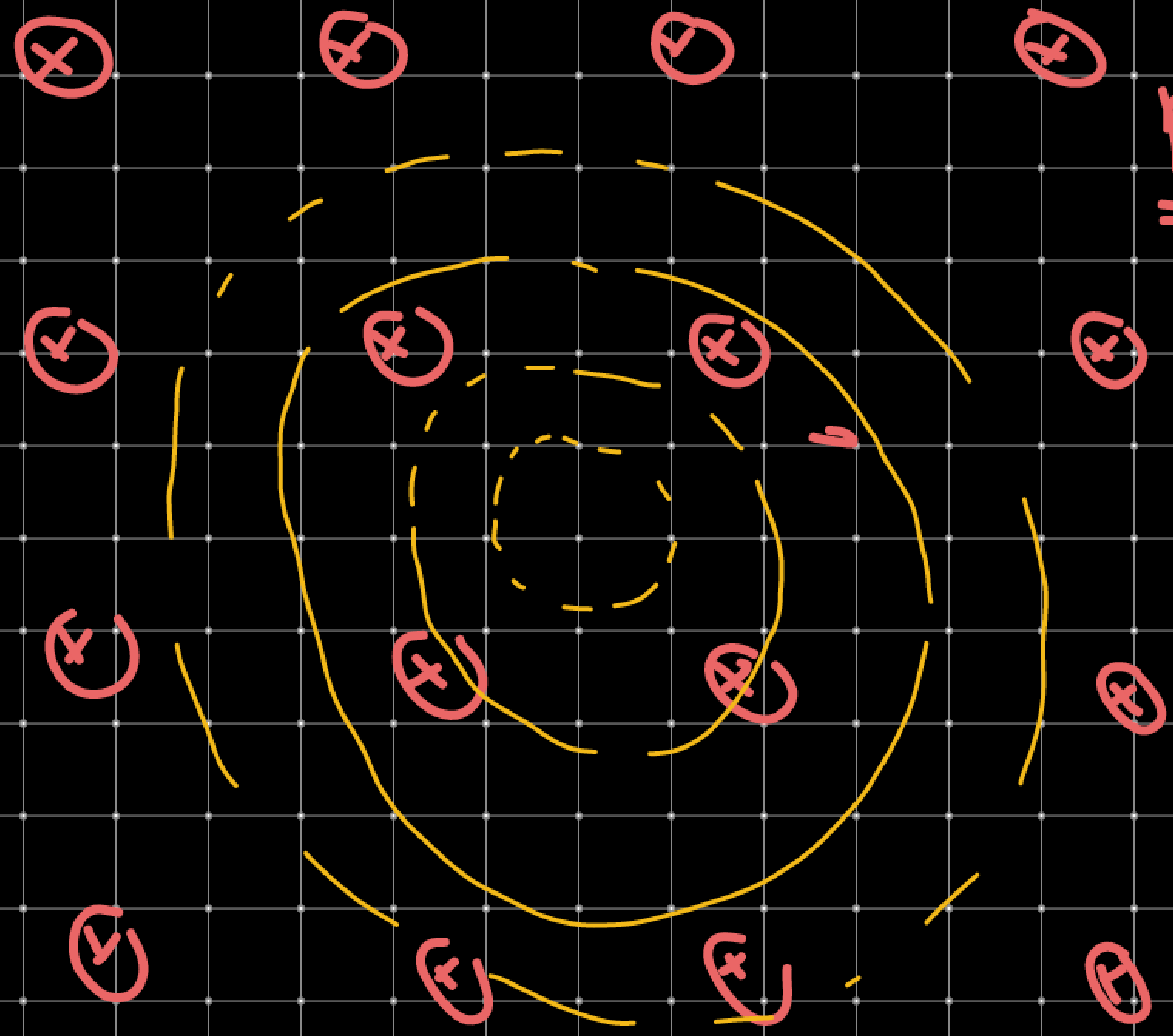
$q \rightarrow$ move with $\vec{v}$ $\bar{E}$ & $\bar{B}$

$q \rightarrow$ accelerated / deaccelerated / osg. $\bar{E}$, $\bar{B}$ & EMW

Induced Electric field

[Non-Conservative in nature]

$B(t)$



#1 Faraday's law

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

H.W

Eddy Current

$$\varepsilon_{ind} = -\frac{d}{dt}(BA)$$

$$\varepsilon_{ind} = -A\frac{dB}{dt}$$

$$-\int \bar{E}\,d\bar{l} = -A\frac{dB}{dt}$$

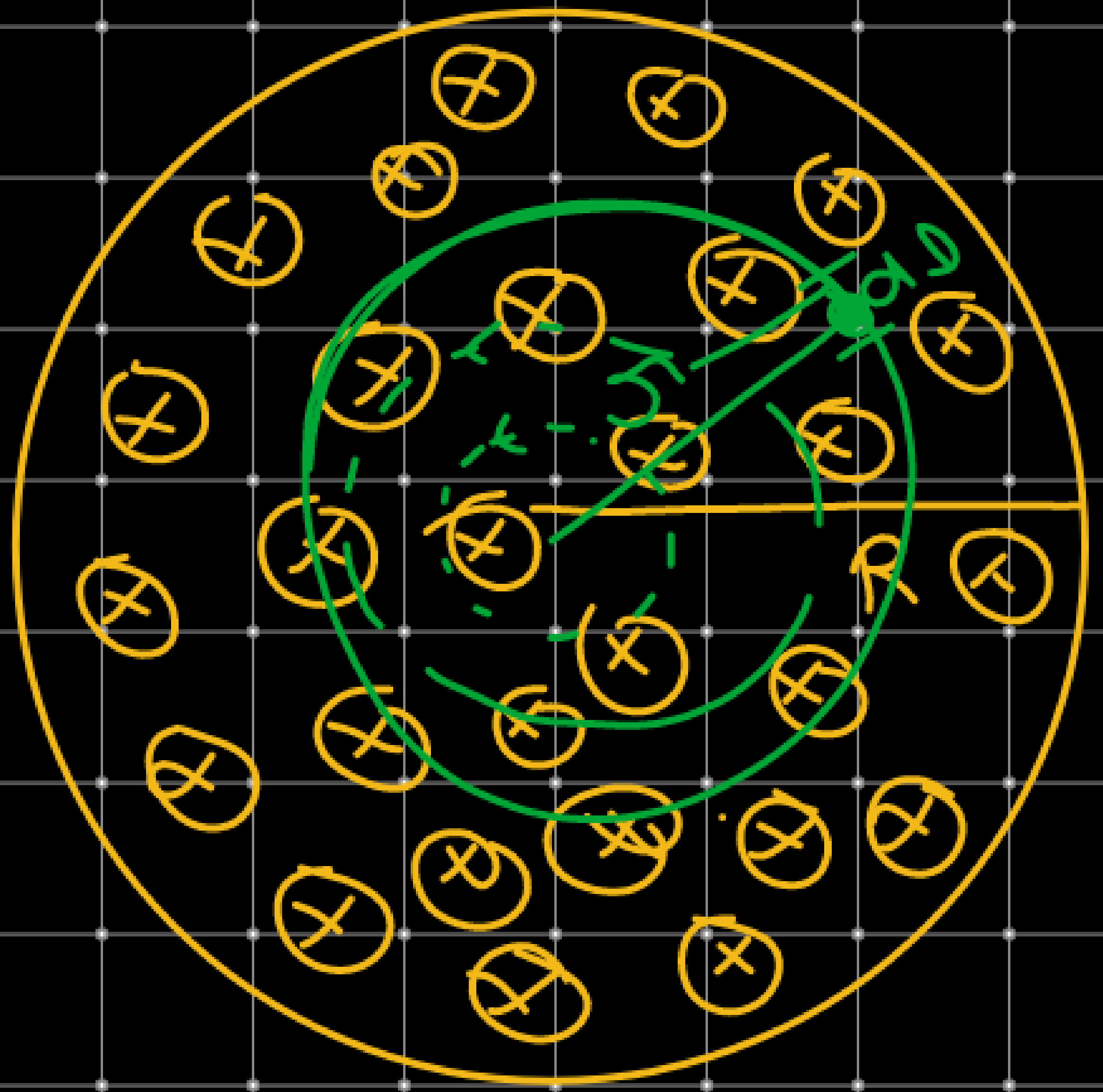
$$\int \bar{E}\,d\bar{l} = A\frac{dB}{dt}$$

→ induced Electric field

$$dV = -E\,dl$$

$$V = -\int E\,dl$$

#



$B(t)$

$E \propto r$

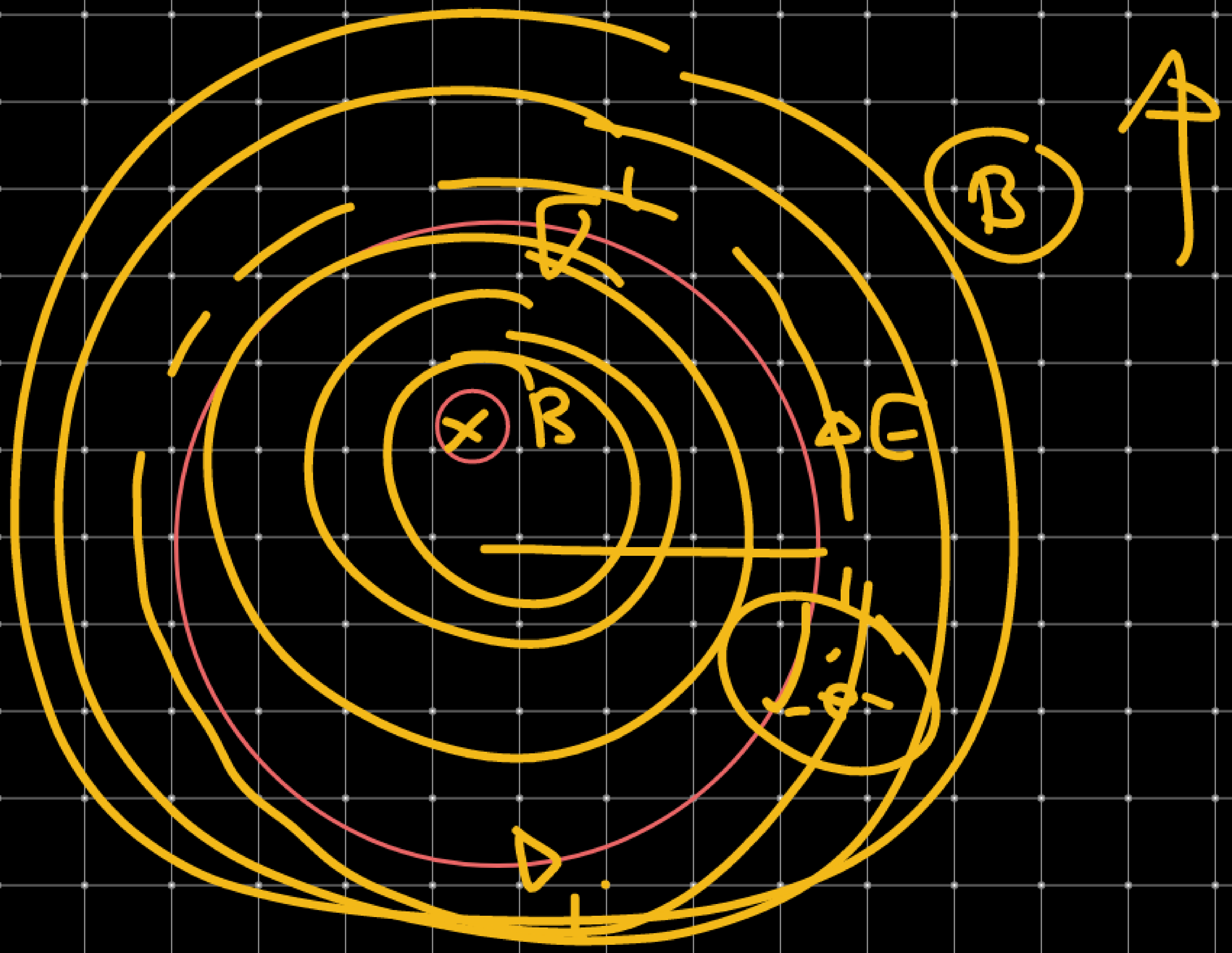
① $r < R$ (inside)

$$\oint \vec{E} \cdot d\vec{l} = A \frac{dB}{dt}$$

$$E \times 2\pi r = A \frac{dB}{dt}$$

$$E \times 2\pi r = \pi r^2 \frac{dB}{dt}$$

$$E = \frac{r}{2} \frac{dB}{dt}$$


B
A

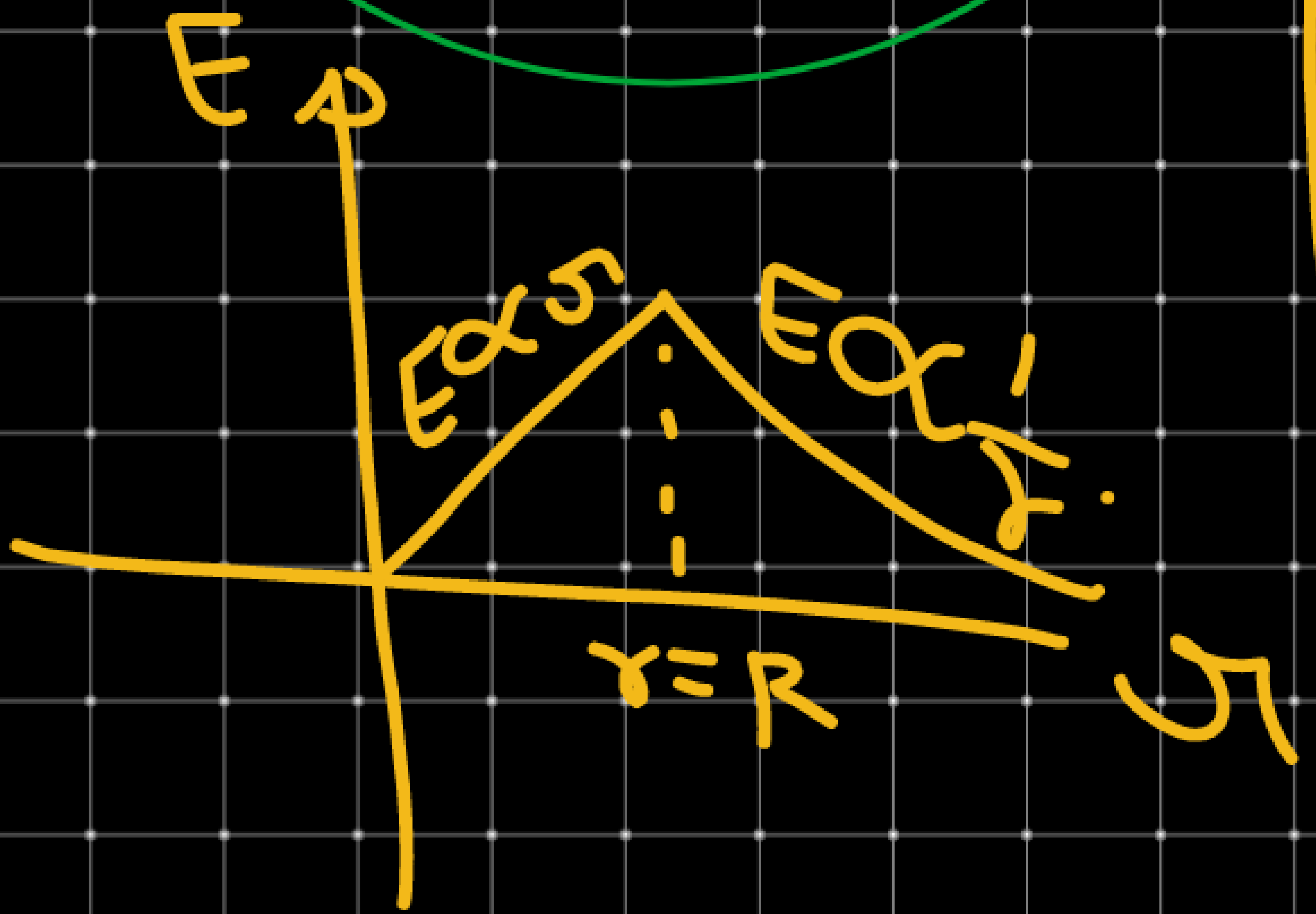
(ii) $r > R$ outside point

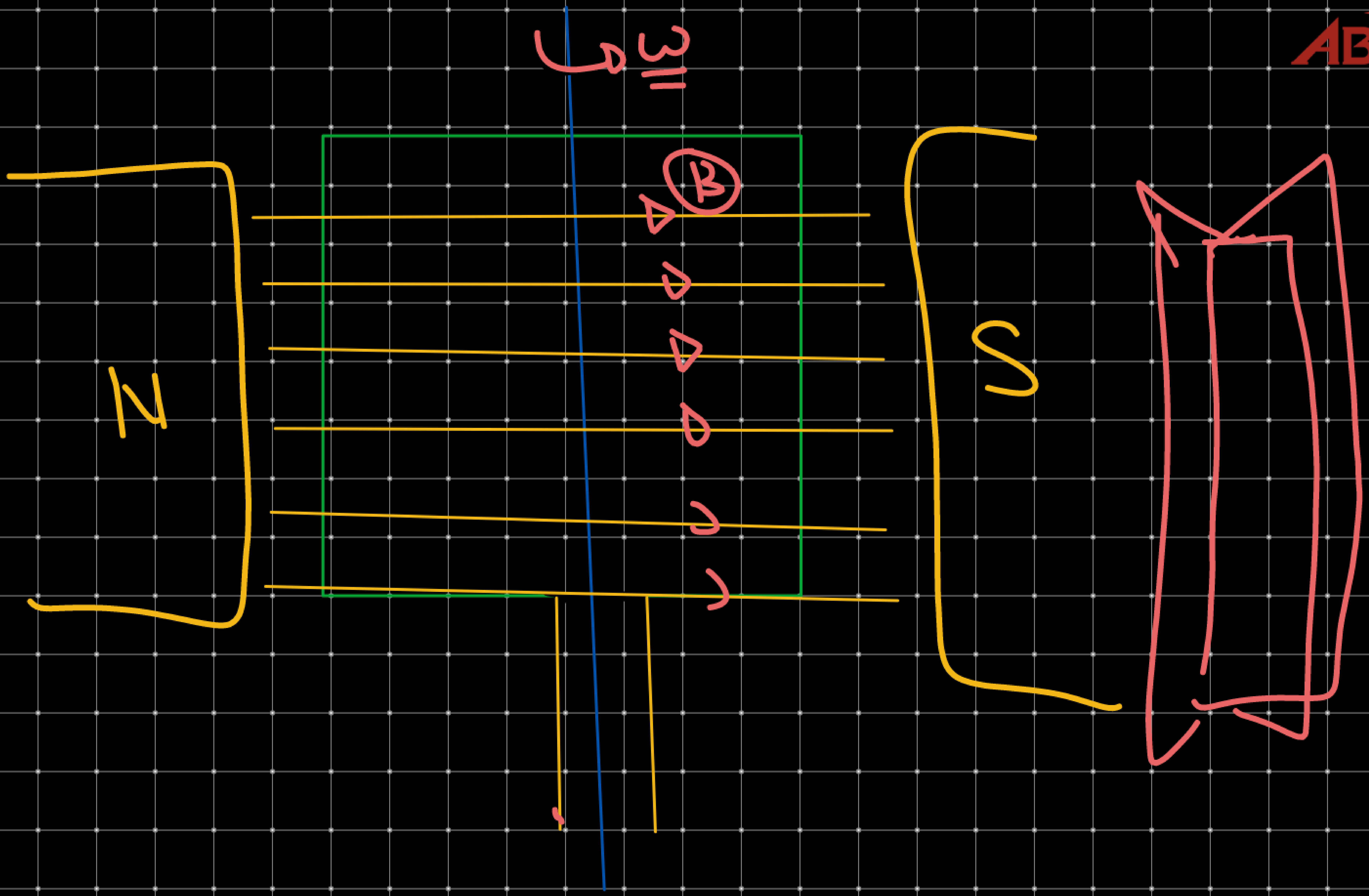
$$\oint \vec{E} \cdot d\vec{l} = A \frac{dB}{dt}$$

$$E \times 2\pi r = \pi R^2 \frac{dB}{dt}$$

$$E = \frac{R^2}{2r} \frac{dB}{dt}$$

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




ω
B
N
S