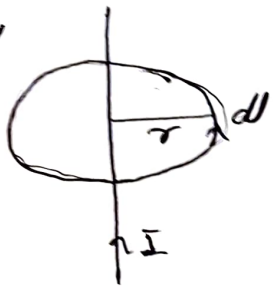
Ampere's circuital law →

It states that the line integral of magnetic field over a closed loop is equal to μ_0 times current enclosed

$$\oint \vec{B}\,d\vec{l} = \mu_0 I \qquad \left[\oint \vec{E}.d\vec{S} = \frac{q}{\epsilon_0}\right]$$

Proof → let a wire carrying current I then magnetic field develop around it & is in the form of concentric circles
let r is radius of amperian loop.



Net magnetic field due to loop is given by

$$\oint \vec{B}.d\vec{l} = \oint B\,dl\cos\theta$$

$$\oint \vec{B}.d\vec{l} = \oint B\,dl \qquad \theta = 0^\circ,\ \cos 0 = 1$$

$$= B\oint dl$$

$$= B\left[l\right]_0^{2\pi r}$$

$$= B\left[2\pi r - 0\right]$$

$$\oint \vec{B}.d\vec{l} = B\cdot 2\pi r \qquad \text{—— (1)}$$

magnetic field near the centre of wire

$$B = \frac{2\mu_0 I}{4\pi r} \qquad \text{— (2)}$$

Put (2) in (1)

$$\oint \vec{B}.d\vec{l} = \frac{2\mu_0 I}{4\pi r} \times 2\pi r$$

$$\oint \vec{B}.d\vec{l} = \mu_0 I$$

Hence proved