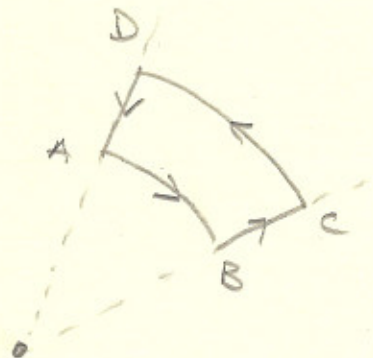


last time: Ampere's Law

$$\oint \vec{H} \cdot d\vec{\ell} = I_{\text{enclosed}}$$

EX:



$$\oint \vec{H} \cdot d\vec{\ell} = 0$$

$$= \int_A^B + \int_B^C + \int_C^D + \int_D^A$$

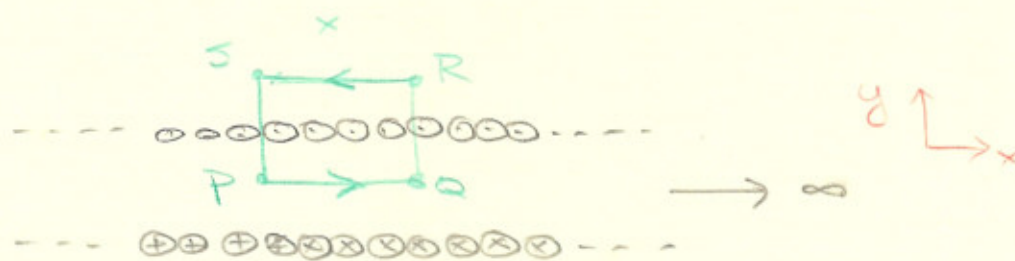
$$\int_A^B \vec{H} \cdot d\vec{\ell} = \int_A^B -|\vec{H}(r_1)| r_1 d\theta = -|\vec{H}(r_1)| r_1 \Delta\theta$$

$$|\vec{H}(r_1)| = -\frac{I}{2\pi} \Delta\theta$$

$$\int_C^D \vec{H} \cdot d\vec{\ell} = +|\vec{H}(r_2)| r_2 \Delta\theta$$

$$|\vec{H}(r_2)| = \frac{I}{2\pi} \Delta\theta$$

Ex: Consider the solenoid, n turns per unit length



$$\oint_{PQRS} \vec{H} \cdot d\vec{l} = |\vec{H}| \cdot \overline{PQ} = n \overline{PQ} I$$

$$\vec{H} = nI \hat{x}$$