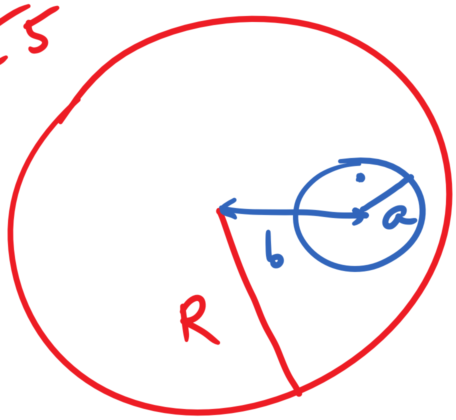
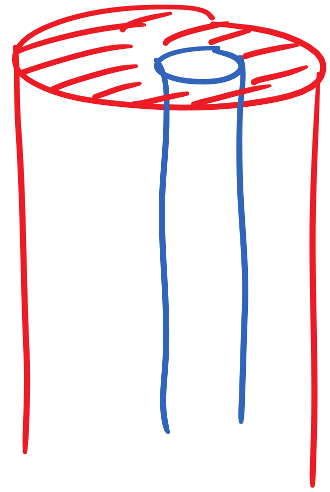
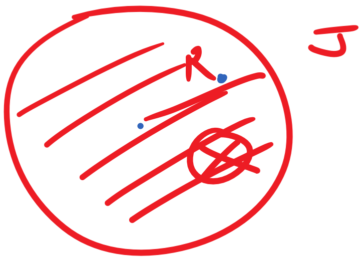
Q 6 / PS-5



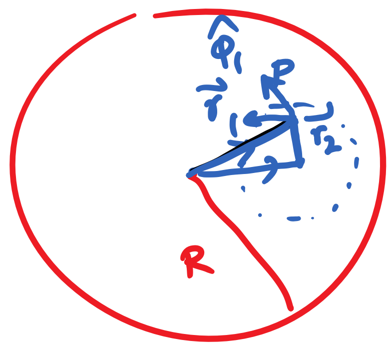


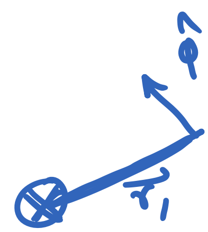


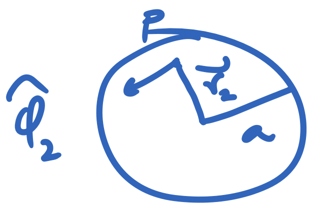
$$\oint \vec{B}\cdot d\vec{l} = \mu_0 I_{enc}$$

$$2\pi r B = \mu_0 J.\pi r^2$$

$$\boxed{\vec{B}_1 = \frac{\mu_0 J r_1}{2}\hat{\varphi}_1}$$







$$\vec{B}_2 = -\frac{\mu_0 J r_2}{2}\hat{\varphi}_2$$

$$J r \varphi_1 = \vec{J}\times\vec{r}_1 = J.r_1.\hat{\varphi}_1$$

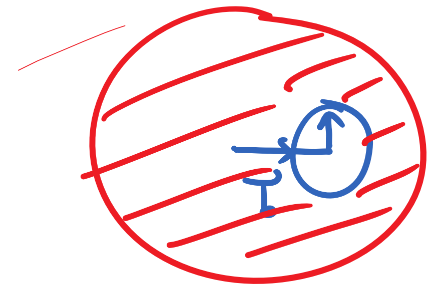
$$J r_2 \hat{\varphi}_2 = \vec{J}\times\vec{r}_2$$

$$\vec{B}_1 = \frac{\mu_0 J}{2}$$

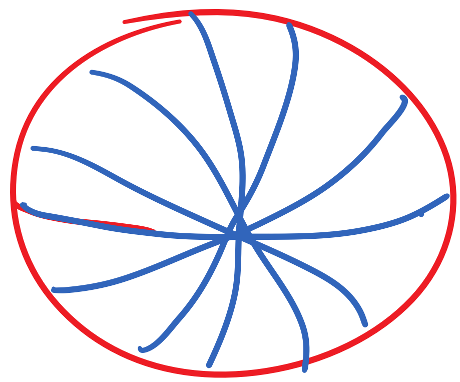
$$\vec{B} = \vec{B}_1 + \vec{B}_2 = \frac{\mu_0}{2}\left(\vec{J}\times\vec{r}_1 - \vec{J}\times\vec{r}_2\right)$$

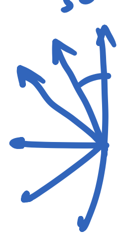
$$= \frac{\mu_0}{2}\vec{J}\times(\vec{r}_1 - \vec{r}_2) = \frac{\mu_0 \vec{J}\times\vec{b}}{2}$$

$$\boxed{\vec{B} = \frac{\mu_0}{2}\vec{J}\times\vec{b}} = \left(\frac{\mu_0}{2}\frac{I\ b}{\pi(R^2-a^2)}\right) \text{ Magnitude}$$



Q8
PS5





$$\nabla \cdot \vec{B} = 0 \qquad \nabla \times \vec{B} = \mu_0 \vec{J}$$

$$\Downarrow$$

$$\vec{B} = \nabla \times \vec{A}$$

$$\vec{A}' = \vec{A} + \nabla \phi$$

$$\nabla \times \vec{A}' = \nabla \times \vec{A} + \nabla \times (\nabla \phi)$$

$$= \nabla \times \vec{A} = \vec{B}$$

COULOMB GUAGE

$$\boxed{\nabla \cdot \vec{A} = 0}$$

$$\oint \vec{B} \cdot \vec{dl} = \mu_0 I_{enc}$$

Magnetic flux

$$\int \vec{B} \cdot d\vec{a} = \int (\nabla \times \vec{A}) \cdot d\vec{a}$$

area vector

$$= \oint \vec{A} \cdot \vec{dl}$$