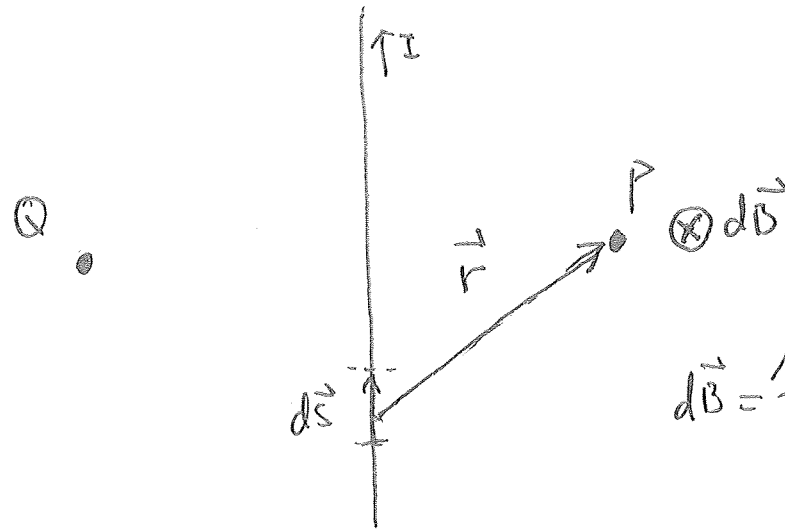
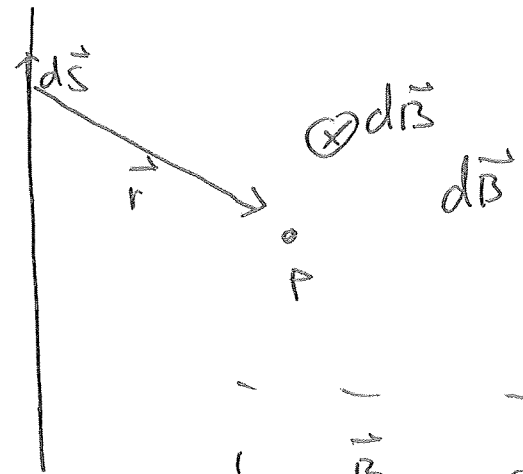
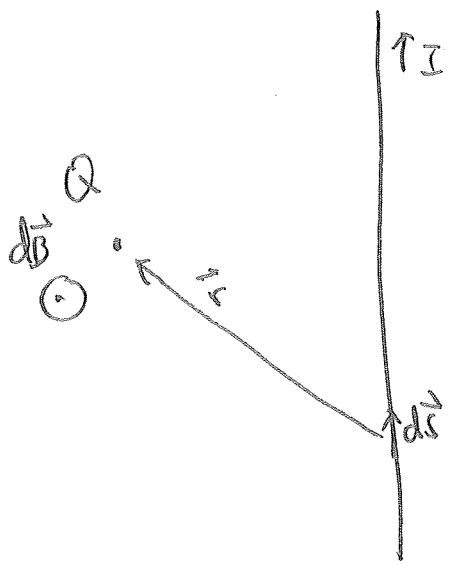
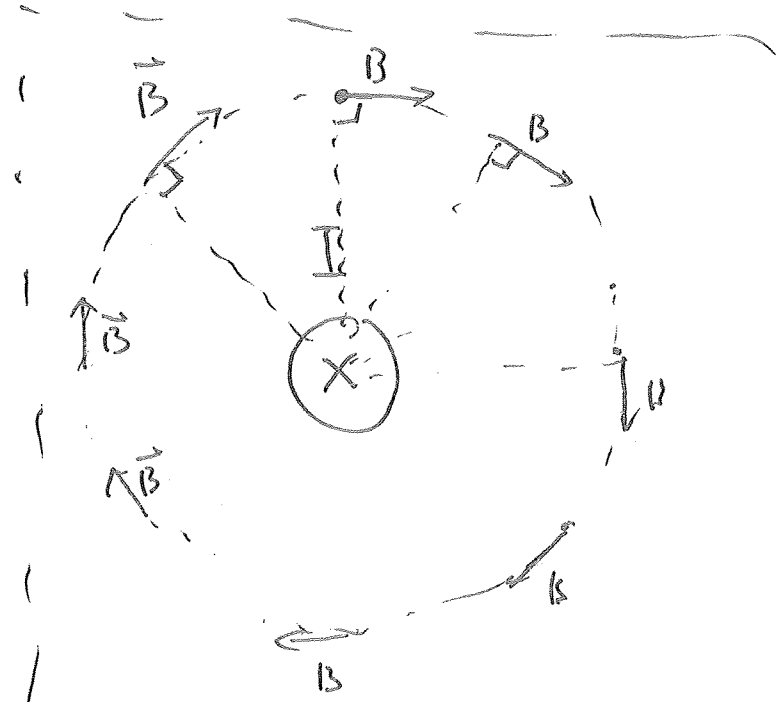
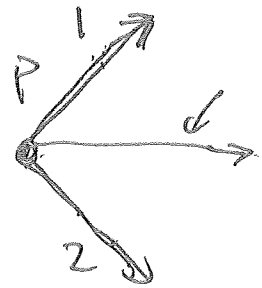


$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{s} \times \hat{r}}{r^2}$$





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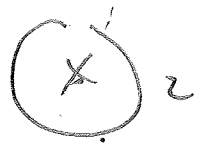
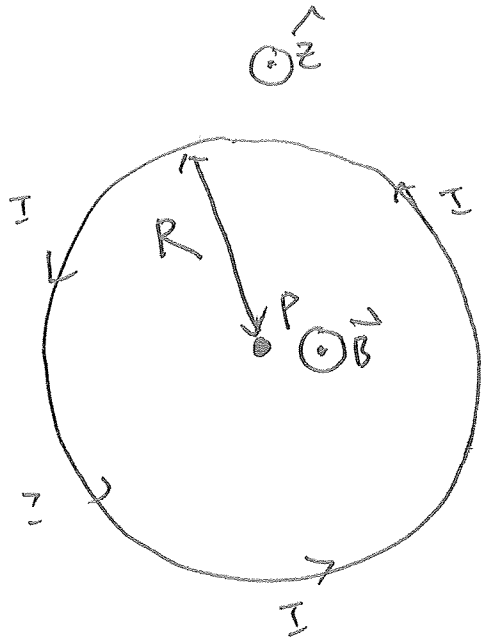

2


1



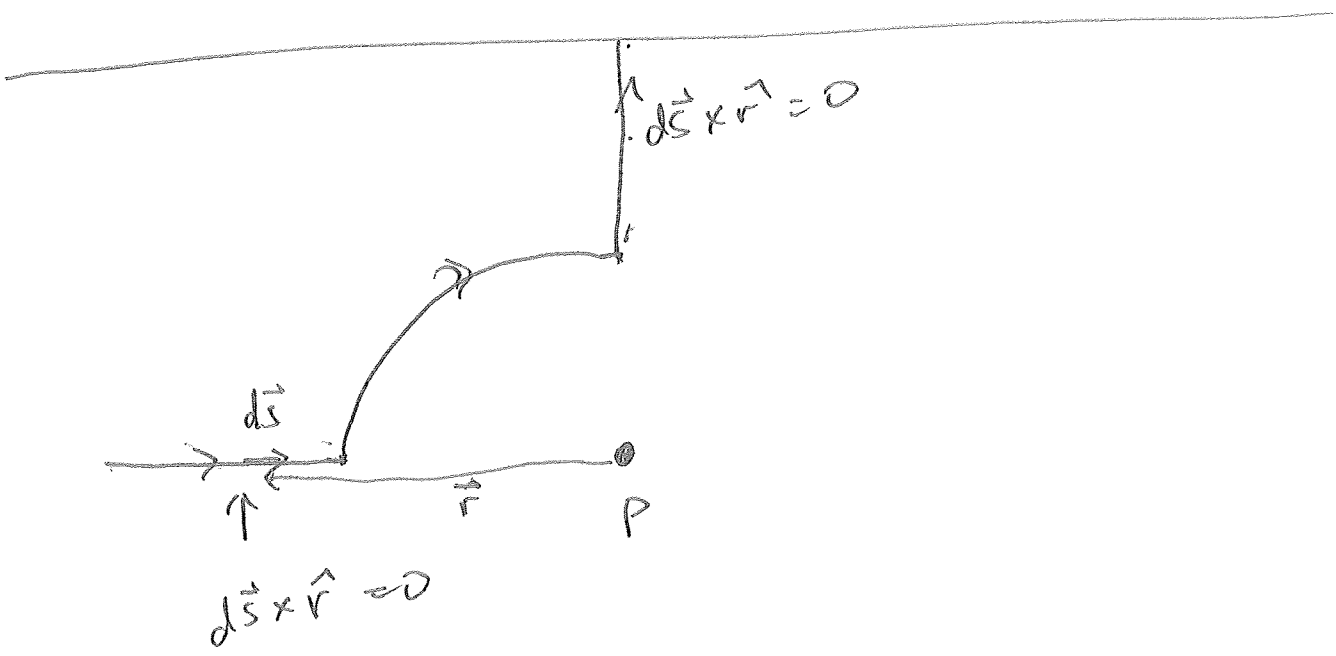
$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{s} \times \hat{r}}{r^2}$$

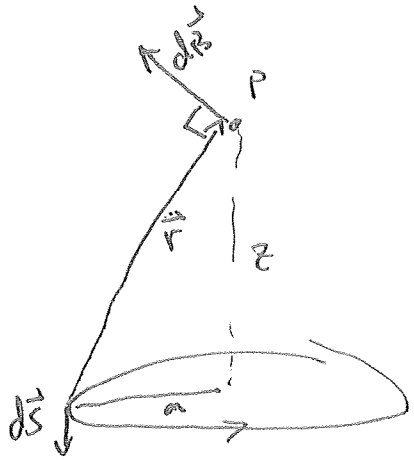
$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{|d\vec{s}|}{R^2} \hat{z}$$

$$\int |d\vec{s}| \int d\vec{B} = \vec{B}$$

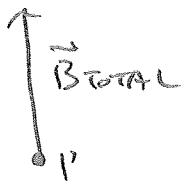
$$\int |d\vec{s}| = 2\pi R$$

$$\vec{B} = \frac{\mu_0 I}{2R} \hat{z}$$

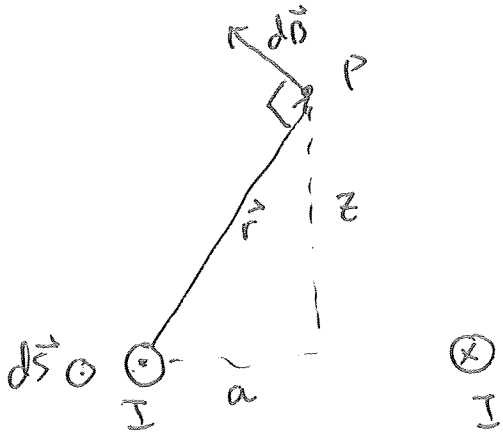




$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{s} \times \hat{r}}{r^2}$$



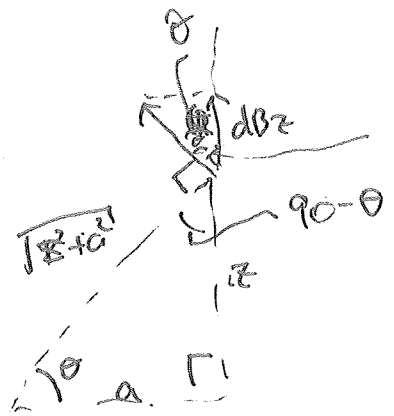
⇒ ONLY z COMPONENTS ADD



$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{d\vec{s} \times \hat{r}}{r^2} \qquad r = |\vec{r}| = \sqrt{z^2 + a^2}$$

$$|d\vec{B}| = \frac{\mu_0 I}{4\pi} \frac{|d\vec{s}|}{(z^2 + a^2)}$$

BUT WE ONLY WANT TO ADD z COMPONENT

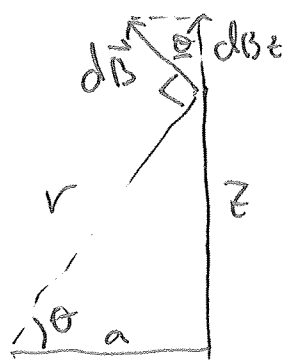


180 - 90 - 90 - θ

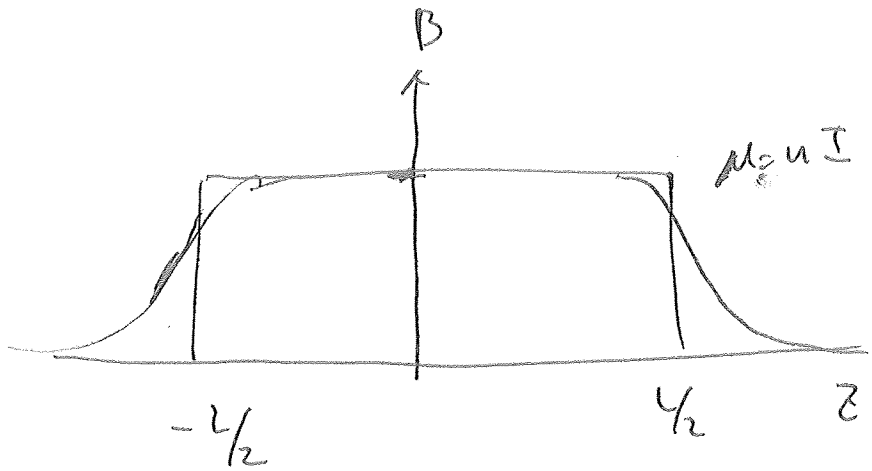
$$\frac{|d\vec{B}_z|}{|d\vec{B}|} = \frac{a}{\sqrt{z^2 + a^2}}$$

$$|d\vec{B}_z| = \frac{\mu_0 I}{4\pi} \frac{|d\vec{s}|}{z^2 + a^2} \frac{a}{\sqrt{z^2 + a^2}}$$

$$|\vec{B}| = \frac{\mu_0 I}{4\pi} \frac{2\pi a}{(z^2 + a^2)} \frac{a}{\sqrt{z^2 + a^2}}$$



$$\frac{|dB_z|}{|dB|} = \frac{a}{r}$$



μ_0 MAGNETIC MONOPOLE

AMPERE'S LAW

$$\oint \vec{B} \cdot d\vec{S} = \mu_0 I$$