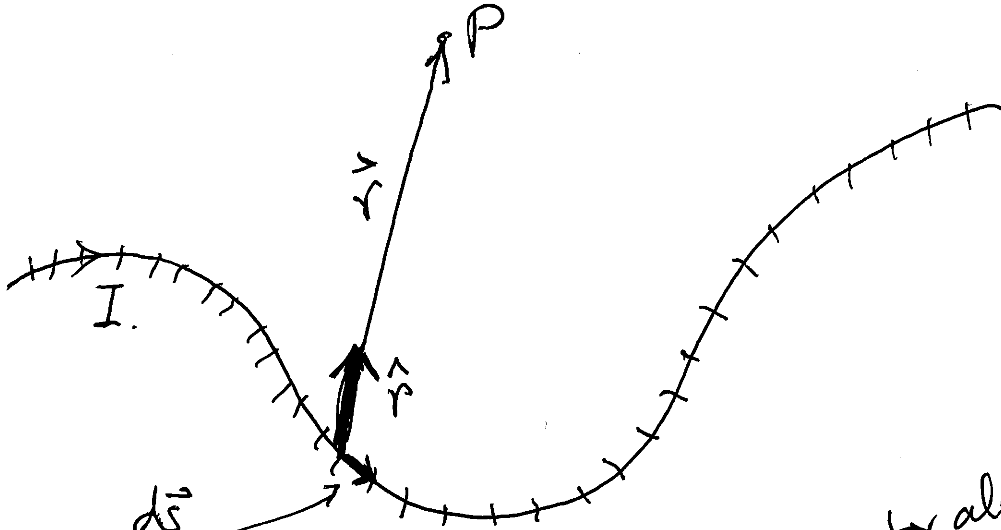


$d\vec{s}$
or $d\vec{l}$

Unit vector along $\vec{r}$. $r\hat{r} = \vec{r}$

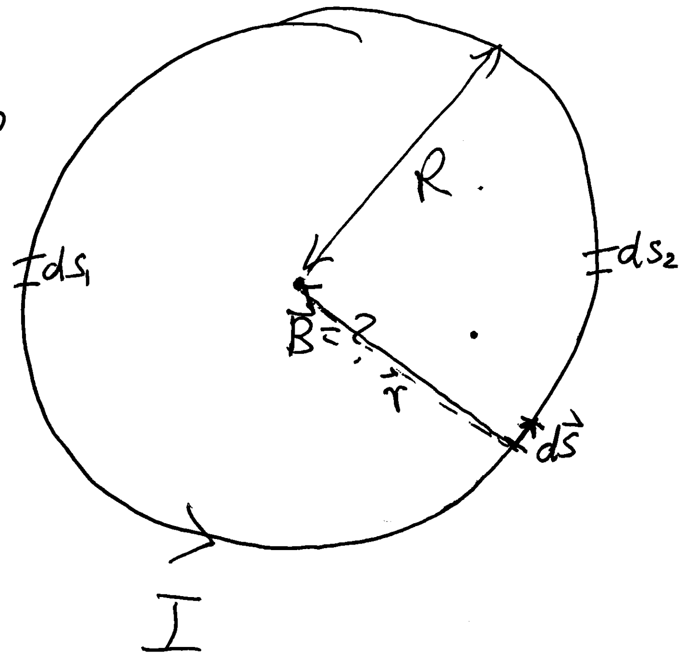
$$d\vec{B} = \frac{\mu_0}{4\pi}\left(\frac{I\,d\vec{s} \times \hat{r}}{r^2}\right)$$

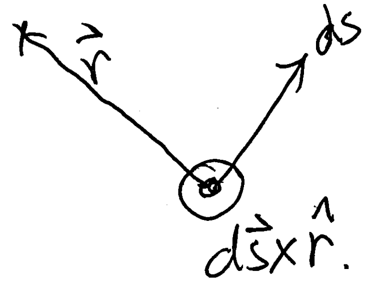
magnitude of $\vec{r}$.

a very small vector

Direction of $\vec{B}$??

$$\left.\begin{array}{l} dB_1 \otimes \\ dB_2 \odot \end{array}\right] \; d\vec{B} \otimes .$$





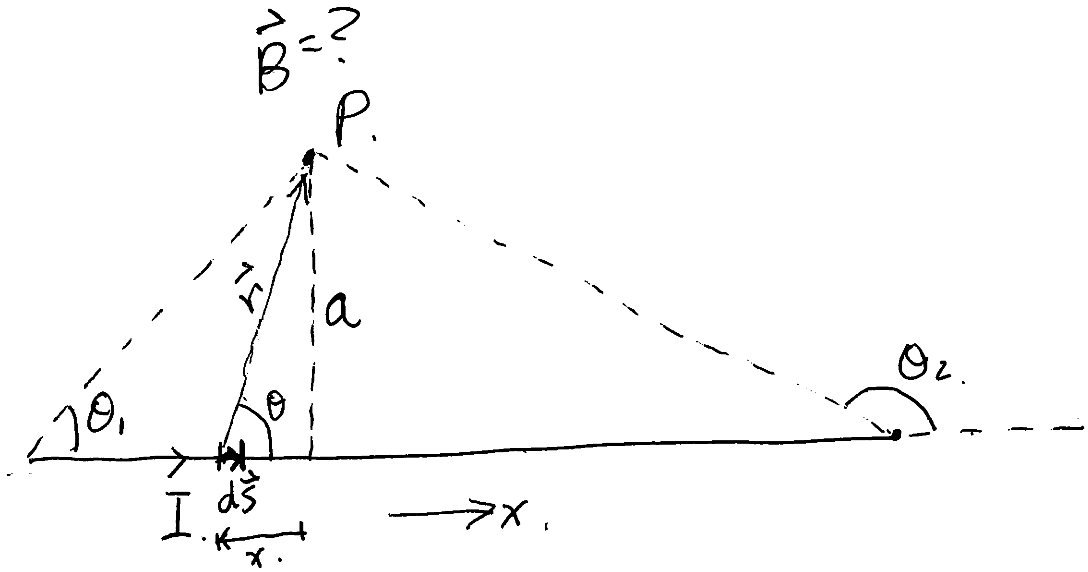
$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{ds \times 1 \times \sin 90^\circ}{r^2} \odot$$

$$r = R.$$

$$\therefore \vec{B} = \int d\vec{B} = \frac{\mu_0 I}{4\pi R^2} \odot \int ds.$$

$$= \frac{\mu_0 I}{4\pi R^2} \times 2\pi R \odot$$

$$= \underline{\underline{\frac{\mu_0 I}{2R} \odot}}$$



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

$$d\vec{B} = \frac{\mu_0 I}{4\pi} \frac{dx \sin\theta}{r^2} \odot$$

$$\tan\theta = \frac{-a}{x} \Rightarrow x = \frac{a}{\tan\theta} = -a\cot\theta.$$

$$dx = + \frac{a\,d\theta}{\sin^2\theta}$$

$$\cancel{r} \quad a = r\sin\theta \Rightarrow r = \frac{a}{\sin\theta}.$$

$$d\vec{B} = \frac{\mu_0 I}{4\pi} \cdot \frac{+\frac{a\,d\theta}{\sin^2\theta}}{\left(\frac{a}{\sin\theta}\right)^2} \sin\theta \odot$$

$$= +\frac{\mu_0 I}{4\pi a} \sin\theta\, d\theta \odot.$$

$$\vec{B} = +\frac{\mu_0 I}{4\pi a} \odot \int_{\theta_1}^{\theta_2} \sin\theta\, d\theta$$

$$= -\frac{\mu_0 I}{4\pi a} \odot \left[\cos\theta\right]_{\theta_1}^{\theta_2}$$

$$= -\frac{\mu_0 I}{4\pi a} \odot \left(\cos\theta_2 - \cos\theta_1\right).$$

$$= \frac{\mu_0 I}{4\pi a} \left(\cos\theta_1 - \cos\theta_2\right) \odot.$$

For infinite long wire,

$\theta_1 = 0°$, $\theta_2 = 180°$.

$$\vec{B} = \frac{\mu_0 I}{4\pi a}(1-(-1)) \odot = \frac{\mu_0 I}{2\pi a} \odot$$