5-14-14
4B

IN ADDITION TO NOTES FURTHER DOWN THIS INSTALLMENT, SEE:

(A.) CH 28: See 5-9-14.

AT 5-9-14,
See other links to CH 28:

3-24, 3-28, 4-21, 4-25,
4-9.

See problem summaries for these links
see sample exam
solutions from
nvphysics.com.

(B.) CH29: See 5-5-14

Ch 29 links are 3-24, 4-23,
4-28.

see HINTS to #6, 52, 54.
study #8 carefully.
See ALSO 5-9-14.

5-14-14

Master problems for test:

summary before

T4 + 5-9-14

Links:

important date has links to ch 28, 29.

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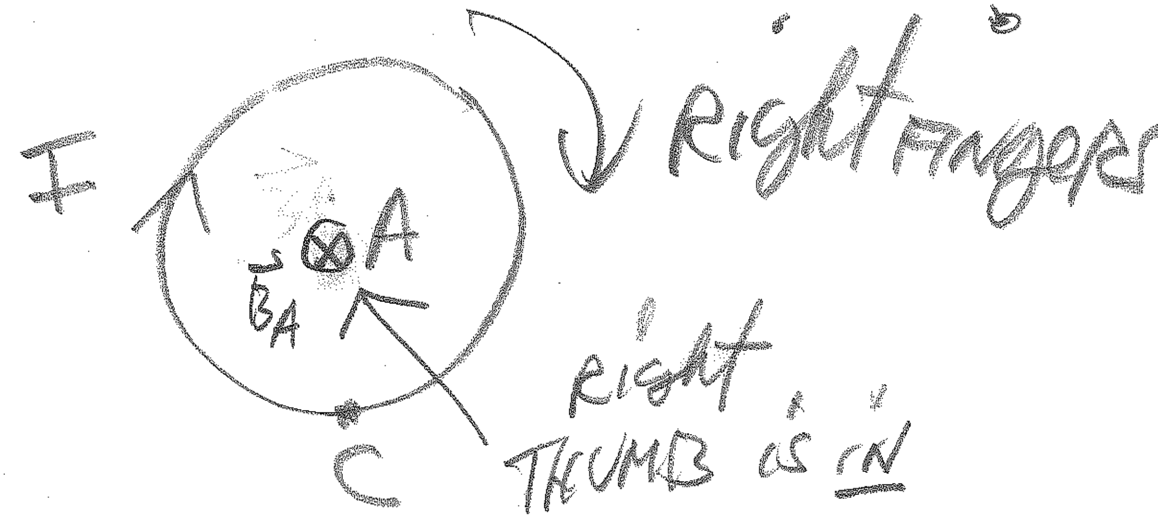
76. → CH 28 nice summary

36., 71. → CH 29 summary

38.

CH 28

76.



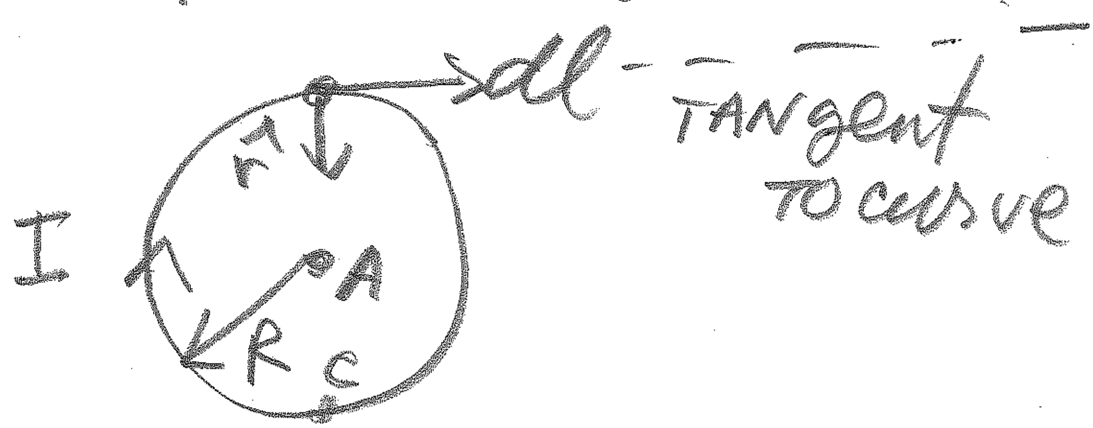
(a.) FIND $\vec{B}_A$.

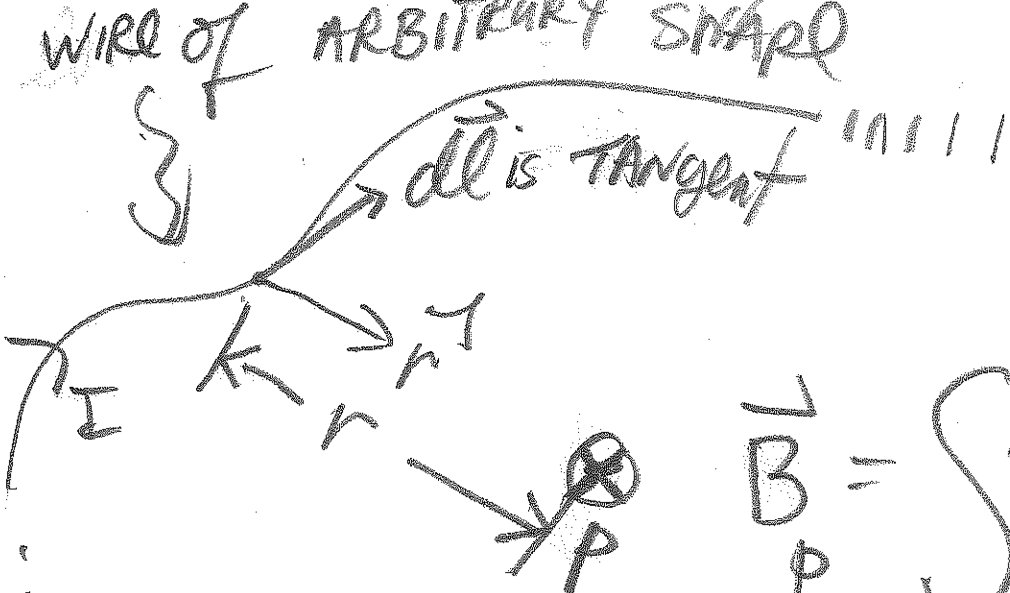
DIRECTION: IN

sec. 28.5 results give a major R.H.R. for $\vec{B}$.

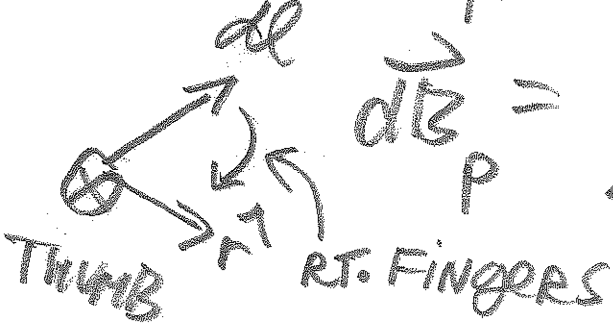
(a) MAGNITUDE:

$$\left|\vec{dB}_A\right| = \left|\frac{\mu_0}{4\pi} \cdot \frac{I\,\vec{dl} \times \hat{r}}{r^2}\right|$$



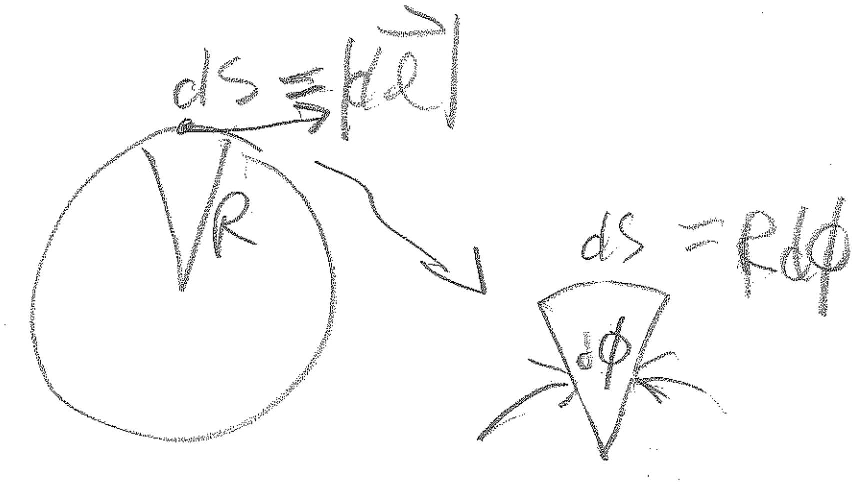


$$\vec{B}_P = \int_{\text{WIRE}} \frac{\mu_0}{4\pi} \frac{I\,\vec{dl} \times \hat{r}}{r^2}$$



$$\vec{dB}_P = \frac{\mu_0}{4\pi} \cdot \frac{I\,\vec{dl} \times \hat{r}}{r^2}$$

$\otimes$ IN

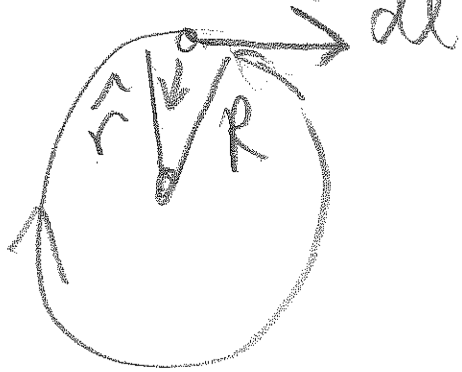


$$|d\vec{B}_A| = \frac{\mu_0}{4\pi}\frac{I}{r^2}|d\vec{l}\times\hat{r}|$$

$$|d\vec{l}\times\hat{r}| = |d\vec{l}|\cdot|\hat{r}|\cdot\sin 90^\circ$$

$$= ds\cdot 1\cdot 1$$

$$= ds$$



$$B_A = \int_{circle} dB_A = \frac{\mu_0}{4\pi} \cdot \frac{I}{R^2} \cdot \int_{circle} ds$$

<u>RIGOROUS SKOOL</u>:

$$ds = R \cdot d\phi$$

$$\int ds = R \int_{circle} d\phi$$

$$= R \cdot 2\pi$$

$$= 2\pi R$$

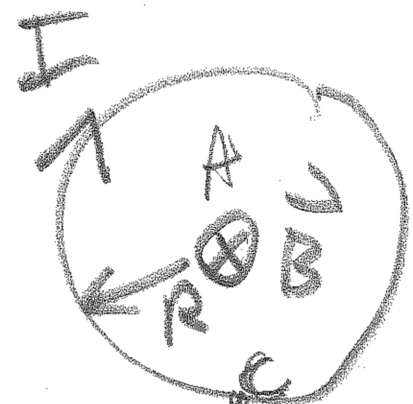
<u>LAY BACK SCHOOL</u>:

$$\int_{circle} ds = 2\pi R$$

CH 28

76 (a)

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

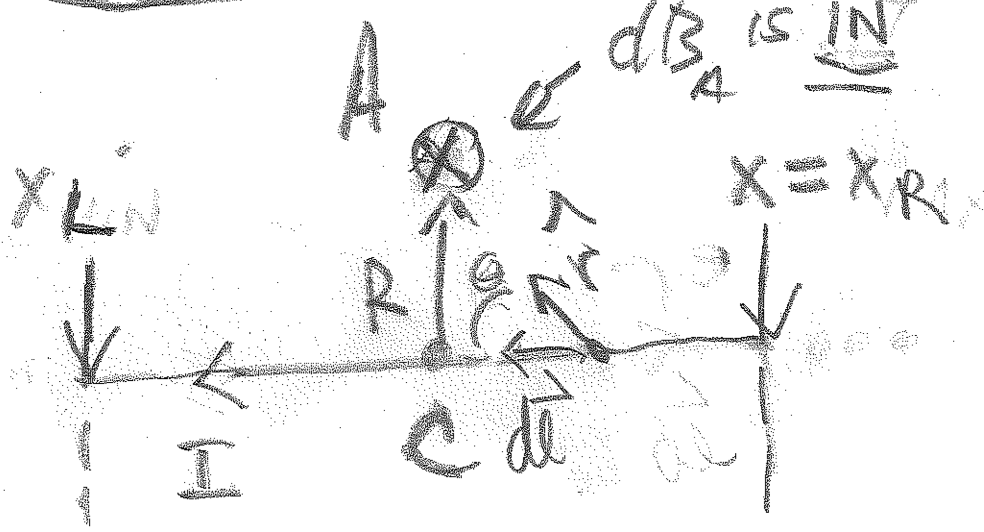


$$\vec{B} = \frac{\mu_0 I}{2R}, \quad \text{IN}$$

(b)

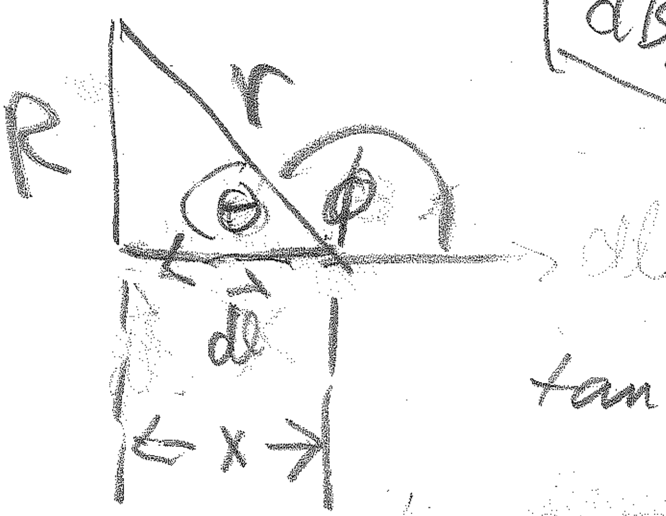
$d\vec{B}_A$ is IN

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



$$\left|d\vec{B}_A\right| = \frac{\mu_0}{4\pi}\cdot\left|\frac{I\,dx\sin\theta}{r^2}\right|$$

$$\boxed{dB_A = \frac{\mu_0\cdot I\cdot dx\cdot\sin\theta}{4\pi\ r^2}}$$



$$\tan\theta = \frac{R}{X}$$

$$x = R\cdot\cot\theta$$

$$\boxed{\phi = 180-\theta}$$

$$dx = R\cdot d(\cot\theta)$$

$$\boxed{\sin\phi = \sin\theta}$$

$$dx = -R\cdot\csc^2\theta\, d\theta$$

$$\sin\theta = \frac{R}{r}$$

$$\csc\theta = \frac{r}{R} \Rightarrow r = R\cdot\csc\theta$$

$$dB_A = \frac{\mu_0}{4\pi} \cdot \frac{I \cdot dx \cdot \sin\theta}{r^2}$$

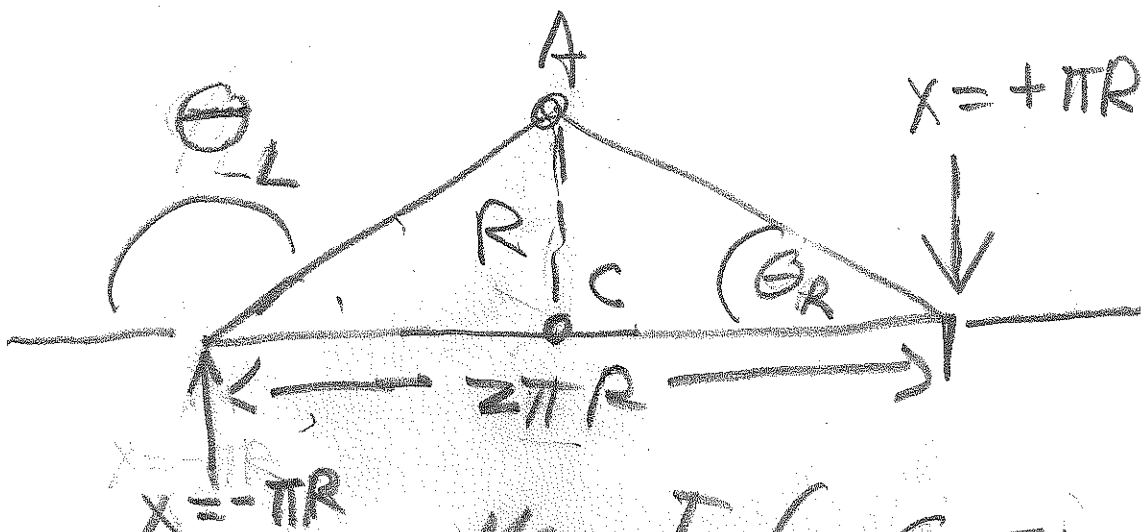
$$= \frac{\mu_0}{4\pi} \cdot I \cdot \frac{\left[-R\csc^2\theta\, d\theta\right] \sin\theta}{R^2 \cdot \csc^2\theta}$$

$$dB_A = -\frac{\mu_0}{4\pi} \cdot \frac{I}{R} \sin\theta\, d\theta$$

$$B_A = -\frac{\mu_0}{4\pi} \cdot \frac{I}{R} \int_{\theta_L}^{\theta_R} \sin\theta\, d\theta = \frac{\mu_0}{4\pi} \cdot \frac{I}{R} \cos\theta \Big|_{\theta_L}^{\theta_R} > 0$$

θ_L at left end.
θ_R " right end.

NOTE:
$0 < \theta_R < 90^\circ$
$90^\circ < \theta_L < 180^\circ$



$$B_A = \frac{\mu_0}{4\pi} \cdot \frac{I}{R}\left(\cos\Theta_R - \cos\Theta_L\right)$$

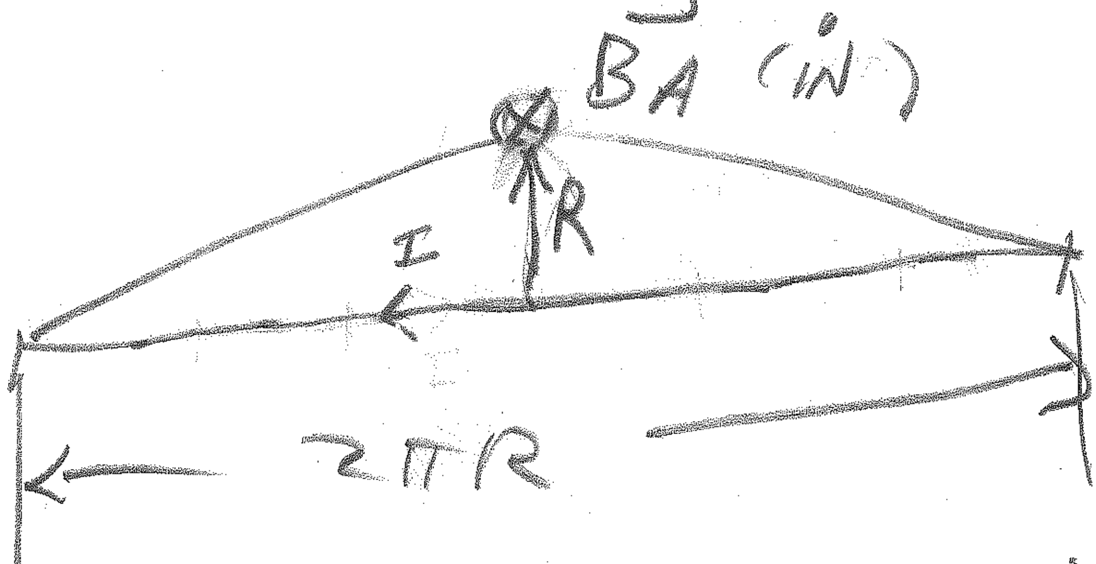
$$\cos\Theta_R = \frac{\pi R}{\sqrt{R^2 + \pi^2 R^2}}$$

$$= \frac{\pi}{\sqrt{1+\pi^2}}$$

$$\cos\Theta_L = -\frac{\pi R}{\sqrt{R^2 + \pi^2 R^2}}$$

$$= -\frac{\pi}{\sqrt{1+\pi^2}}$$

$$B_A = \frac{\mu_0}{4\pi}\cdot\frac{I}{R}\cdot 2\cdot\frac{\pi}{\sqrt{1+\pi^2}}$$

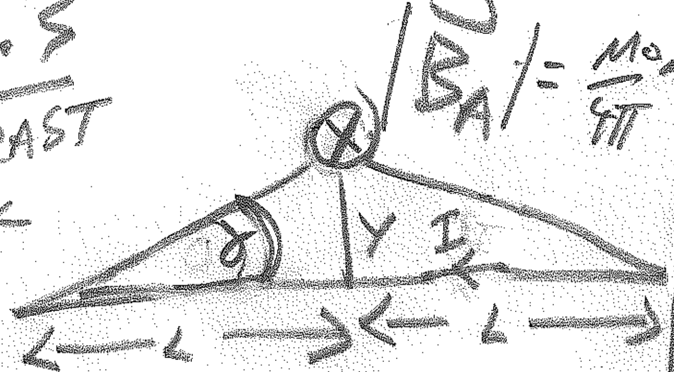


NOTE: IF Y WAS FIXED.

SEE 28.3

NOTE CONTRAST WITH BOOK WHERE Y IS ALONG WIRE.

$$|\vec{B}_A| = \frac{\mu_0}{4\pi}\cdot\frac{I}{y}\cdot 2\cdot\cos\gamma$$



$$\cos\gamma = \frac{L}{\sqrt{L^2+y^2}}$$

HERE: $y \perp$ WIRE. (y = FIXED)

$$B_A = \frac{\mu_0}{4\pi}\cdot\frac{I}{y}\cdot 2\cdot\frac{L}{\sqrt{L^2+y^2}} \xrightarrow{L\to\infty} \frac{\mu_0 I}{2\pi y}$$