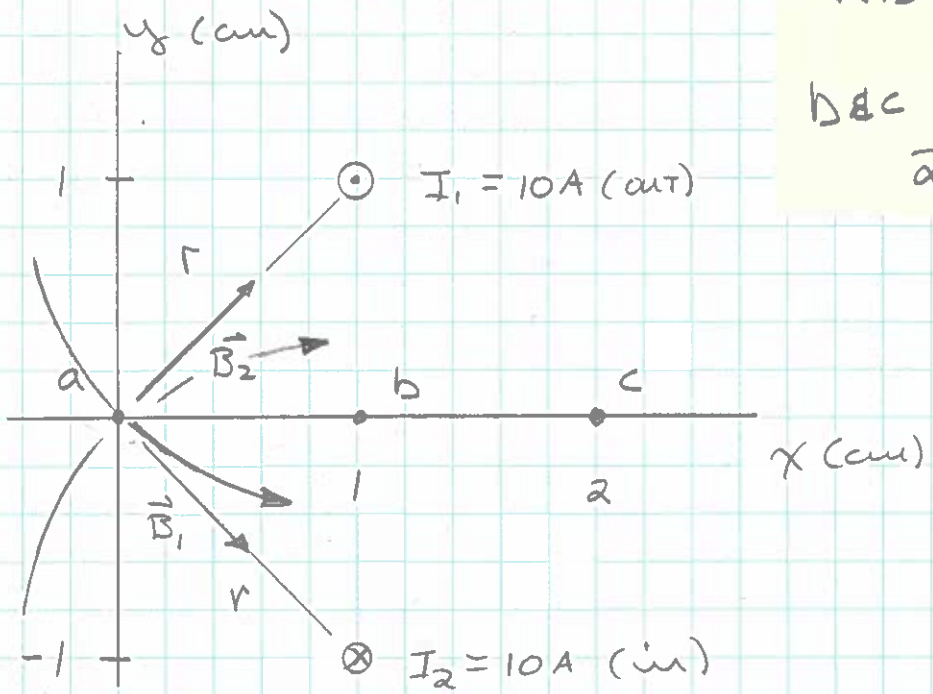
WB 29-4 (a)

DEC HW
29-13



$$\vec{B} = \frac{\mu_0 I}{2\pi}\frac{1}{r}, \text{ direction by RHR.}$$

Point a $\quad r = \sqrt{2}\text{ cm} = 1.414\text{ cm}$ (both)

$$B_1 = B_2 = 1.418\times10^{-4}\text{ T}$$

Now, $\vec{B} = \vec{B}_1 + \vec{B}_2 = (B_1\cos45^\circ\hat{i} - B_1\sin45^\circ\hat{j}) + (B_2\cos45^\circ\hat{i} + B_2\sin45^\circ\hat{j})$

$$= (B_1 + B_2)\cos45^\circ\hat{i}$$

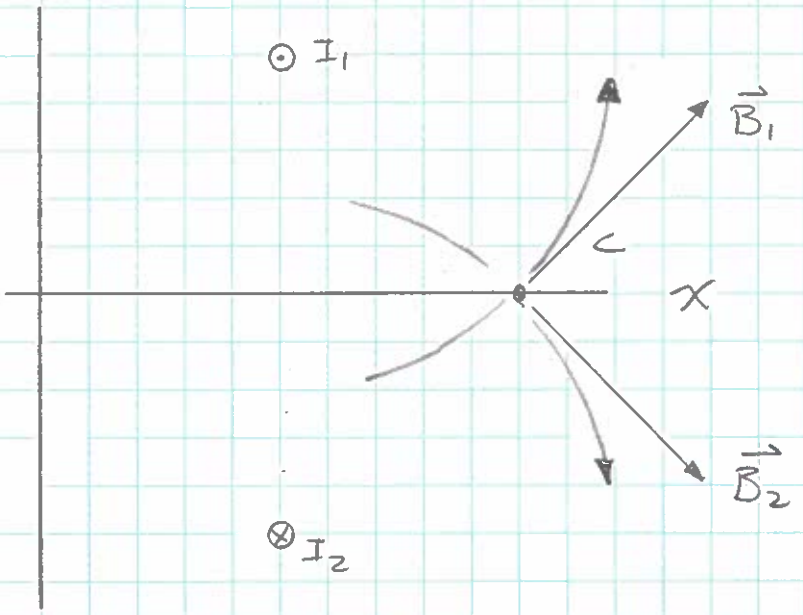
$$\underline{\vec{B} = 2.006\times10^{-4}\hat{i}\text{ T}}$$

Point b $\quad r = 1\text{ cm}$ (both)

$$\vec{B}_1 = \frac{\mu_0 I_1}{2\pi r}\hat{i} \quad \& \quad \vec{B}_2 = \frac{\mu_0 I_2}{2\pi r}\hat{i}$$

$$\vec{B} = \vec{B}_1 + \vec{B}_2 = \frac{2\mu_0(I_1+I_2)}{2\pi r}\hat{i} = \underline{4.011\times10^{-4}\hat{i}\text{ T}}$$

Point c



Same as point a with fields reversed, so:

$$\vec{B} = \vec{B}_1 + \vec{B}_2 = 2.006 \times 10^{-4}\,\hat{i}\ T$$