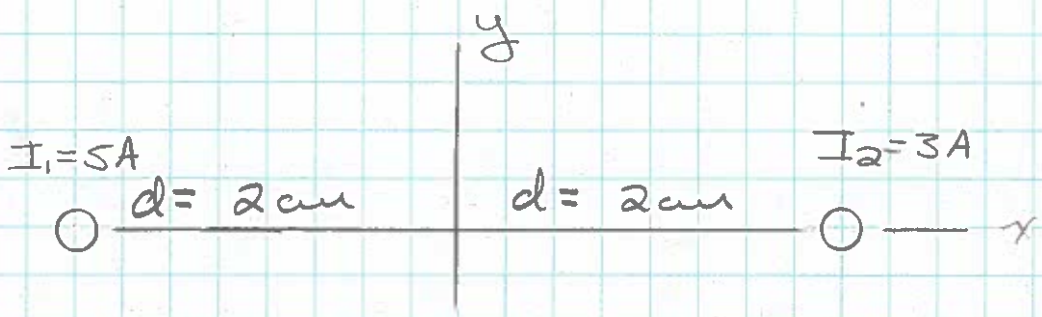
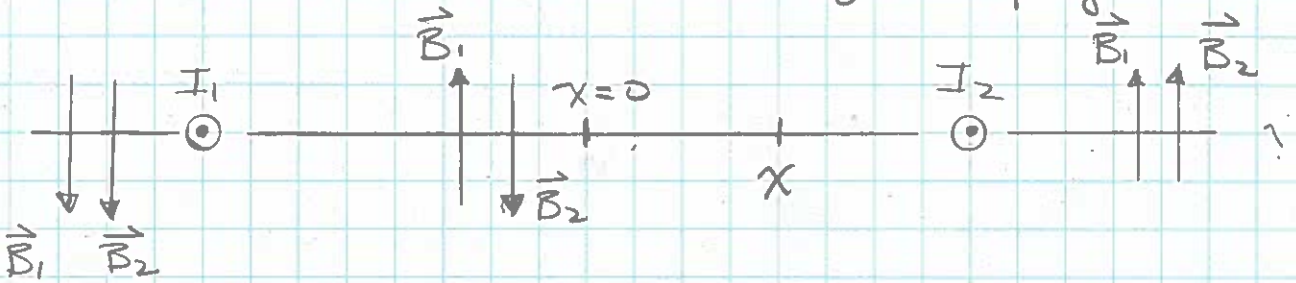


a.) Take both currents out of the page



Only between the currents can the two fields cancel.

At point x: $\vec{B}_1$ is up and $\vec{B}_2$ is down

Total field, $B = \frac{\mu_0 I_1}{2\pi(x+d)} - \frac{\mu_0 I_2}{2\pi(d-x)} = 0$

So:

$$\frac{I_1}{x+d} - \frac{I_2}{d-x} = 0$$

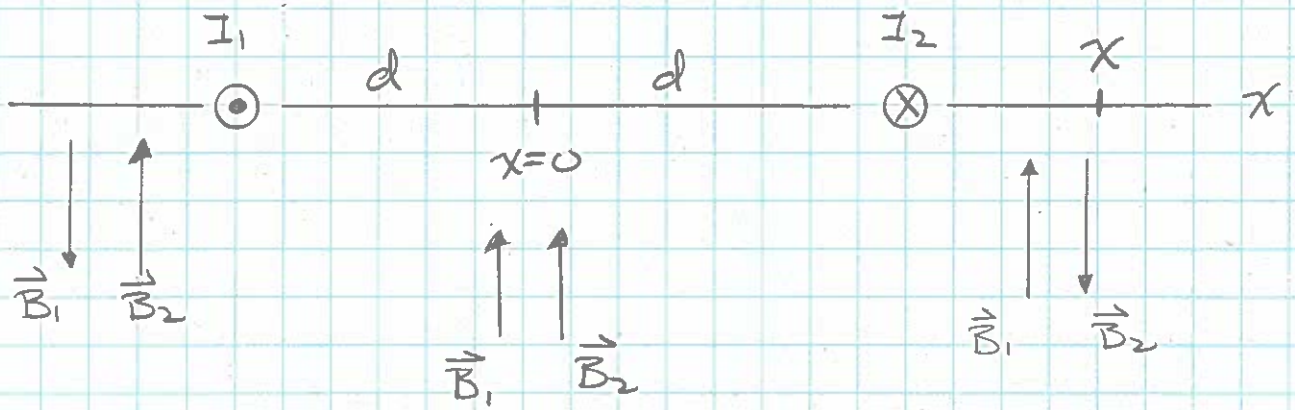
$$I_1(d-x) = I_2(x+d)$$
$$I_1 d - I_1 x = I_2 x + I_2 d$$

So:

$$d(I_1 - I_2) = x(I_2 + I_1)$$

So $$x = d\left(\frac{I_1 - I_2}{I_2 + I_1}\right) = 0.5\,cm$$

b.) Take I_1 out and I_2 in:



for $x < -d$, $|\vec{B}_1|$ is always $> |\vec{B}_2|$, so they can't add to zero.

for $-d < x < d$, $\vec{B}_1$ and $\vec{B}_2$ are in same direction

Only for $x > +d$, can fields add to zero.

So at x ($\vec{B}_1$ is up & $\vec{B}_2$ is down):

$$B = B_1 - B_2 = \frac{\mu_0 I_1}{2\pi(d+x)} - \frac{\mu_0 I_2}{2\pi(x-d)} = 0$$

So:

$$\frac{I_1}{(d+x)} - \frac{I_2}{(x-d)} = 0$$

$$I_1(x-d) = I_2(d+x)$$

$$I_1 x - I_1 d = I_2 d + I_2 x$$

$$(I_1 - I_2)x = (I_2 + I_1)d$$

$$\therefore \quad x = \frac{(I_2+I_1)}{(I_1-I_2)} d = \underline{8.0 \text{ cm}}$$