

Dr. Sasha

At first, I would like to thank you for the letter.

It is the citation from your letter

1. Integration gives

$$B = \frac{\mu_0 I}{2\pi} \left(1 - \frac{a+d}{\sqrt{a^2 + d^2}} \right),$$

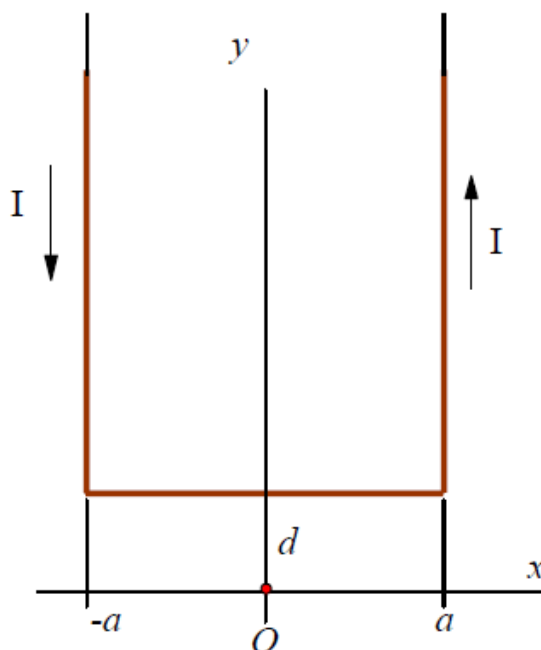
the positive direction is by default downwards (away from the picture).

I do not believe that this is right answer. In limit, $a \rightarrow \infty$ I must receive magnetic field of a long wire which carries an electric current: $B \propto \frac{1}{d}$. But your expression

give for me very strange answer: $\lim_{a \rightarrow \infty} B = \lim_{a \rightarrow \infty} \left(1 - \frac{a+d}{\sqrt{a^2 + d^2}} \right) = 0$.

problem specification

1) Determine the magnetic field (in terms of I, a, and d) at the origin (O) due to the current loop in figure below?



Hint: the Biot-Savart law: $B(\vec{r}) = \frac{\mu_0}{4\pi} \int_C \frac{I \cdot [d\vec{l} \times \vec{r}']}{|\vec{r}'|^3}$, where $\vec{r}' = \vec{r} - \vec{l}$.

