5.15 To find the magnetic field B due to a current-carrying loop, we use the Biot-Savart law, $\vec{B}(\vec{r}) = \frac{\mu_0}{4\pi} I \int \frac{d\vec{l} \times \hat{\mathfrak{R}}}{\mathfrak{R}^2}$

What is the magnitude of $\frac{d\vec{l} \times \hat{\mathfrak{R}}}{\mathfrak{R}^2}$ ?

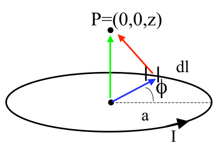
A) $\frac{dl \sin\phi}{z^2}$

B) $\frac{dl}{z^2}$

C) $\frac{dl \sin\phi}{(z^2 + a^2)}$

D) $\frac{dl}{(z^2 + a^2)}$

E) Something quite different!




(Which colored arrow is $\mathfrak{R}$ ? **r**? **r'**? )

5.15 b To find the magnetic field B due to a current-carrying loop, we use the Biot-Savart law, $\vec{B}(\vec{r}) = \frac{\mu_0}{4\pi} I \int \frac{d\vec{l} \times \hat{\mathfrak{R}}}{\mathfrak{R}^2}$

What is $d\mathbf{B}_z$ (the contribution to the vertical component of **B** from this dl segment?)

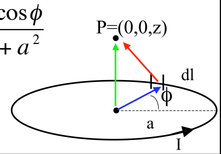
A) $\frac{dl}{z^2 + a^2} \frac{a}{\sqrt{z^2 + a^2}}$

B) $\frac{dl}{z^2 + a^2}$

C) $\frac{dl}{z^2 + a^2} \frac{z}{\sqrt{z^2 + a^2}}$

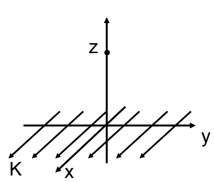
D) $\frac{dl \cos\phi}{z^2 + a^2}$

E) Something quite different!




MD10-1

Consider the B-field a distance z from a current sheet in the z = 0 plane:




The B-field has

A) y-component only

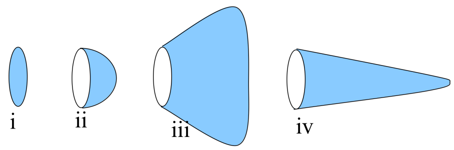
B) z-component only

C) y and z-components

D) x, y, and z-components

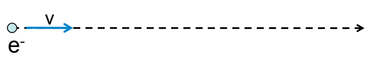
E) Other

5.16 Rank order $\left|\iint \vec{\mathbf{J}} \bullet d\vec{\mathbf{A}}\right|$ (over blue surfaces) where **J** is uniform, going left to right:



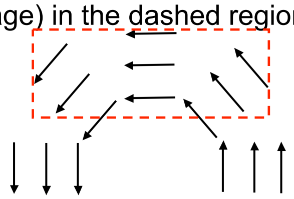

A) iii > iv > ii > i
B) iii > i > ii > iv
C) i > ii > iii > iv
D) Something else!!
E) Not enough info given!!

An electron is moving in a straight line with <u>constant</u> speed v. What approach would you choose to calculate the B-field generated by this electron?




A) Biot-Savart
B) Ampere's law
C) Either of the above.
D) Neither of the above.

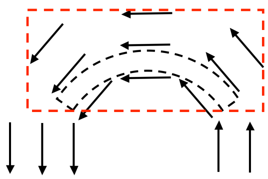
5.17 a If the arrows represent a B field (note that |B| is the same everywhere), is there a nonzero **J** (perpendicular to the page) in the dashed region?



A. Yes
B. No
C. Need more information to decide

5.17 b

If the arrows represent a B field (note that |B| is the same everywhere), is there a nonzero **J** (perpendicular to the page) in the dashed region?

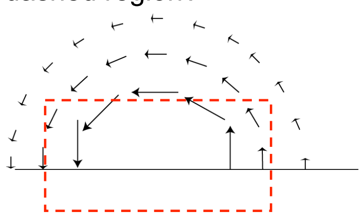


$$\vec{B} = B_0\hat{\varphi}$$

A. Yes
B. No
C. Need more information to decide

5.17 c

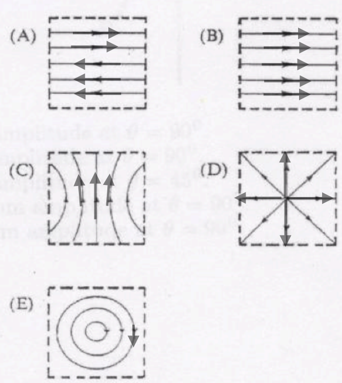
If the arrows represent a B field, is there a **J** (perpendicular to the page) in the dashed region?



A. Yes
B. No
C. Need more information to decide

5.18

Pick a sketch showing B field lines that *violate* one of Maxwell's equations within the region bounded by dashed lines.



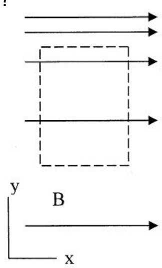

(What currents would be needed to generate the others?)

5.19 The magnetic field in a certain region is given by

$$\vec{B}(x,y) = C y \hat{x}$$

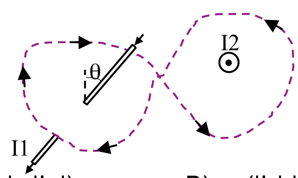
(C is a positive constant) Consider the imaginary loop shown. What can you say about the electric current passing through the loop?

A. must be zero
B. must be nonzero
C. Not enough info




5.22

What is $\oint \vec{\mathbf{B}} \cdot d\vec{\mathbf{l}}$ around this purple (dashed) Amperian loop?




A) $\mu_0$ ($|I_2| + |I_1|$)
B) $\mu_0$ ($|I_2| - |I_1|$)
C) $\mu_0$ ($|I_2| + |I_1| \sin\theta$)
D) $\mu_0$ ($|I_2| - |I_1| \sin\theta$)
E) Something else!