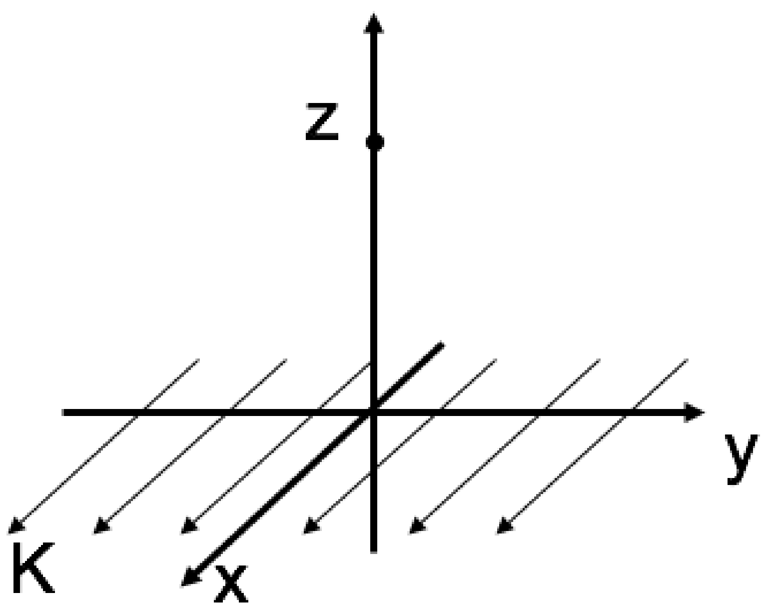
Consider the B-field a distance z from a current sheet (flowing in the +x-direction) in the z = 0 plane. The B-field has:

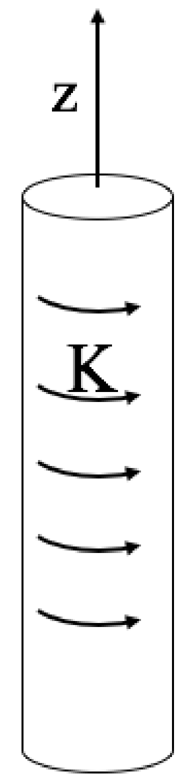


A. y-component only
B. z-component only
C. y and z-components
D. x, y, and z-components
E. Other

I will be in class on Wednesday.

A. Yup
B. Nope, hoss, I'll be out.

An infinite solenoid with surface current density K is oriented along the z-axis. To use Ampere's Law, we need to argue what we think $\mathbf{B}(\mathbf{r})$ depends on and which way it points.

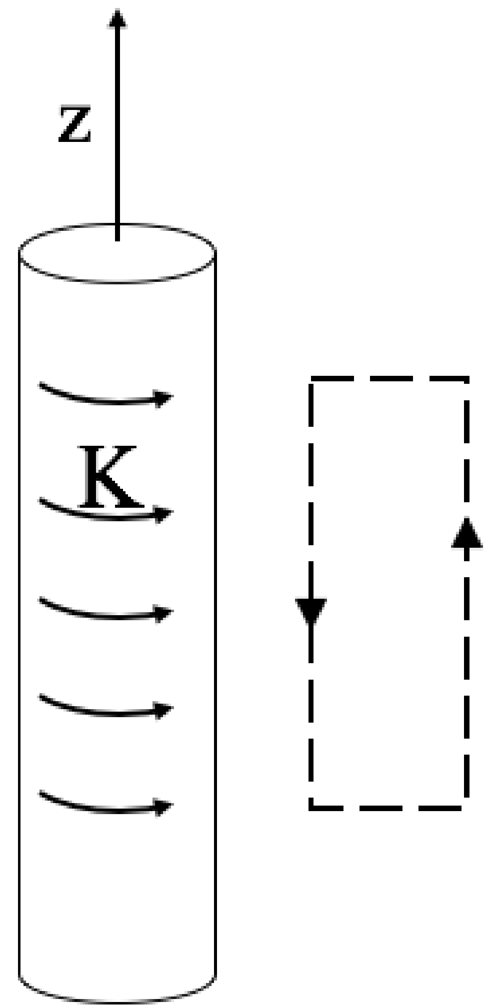


For this solenoid, $\mathbf{B}(\mathbf{r}) =$

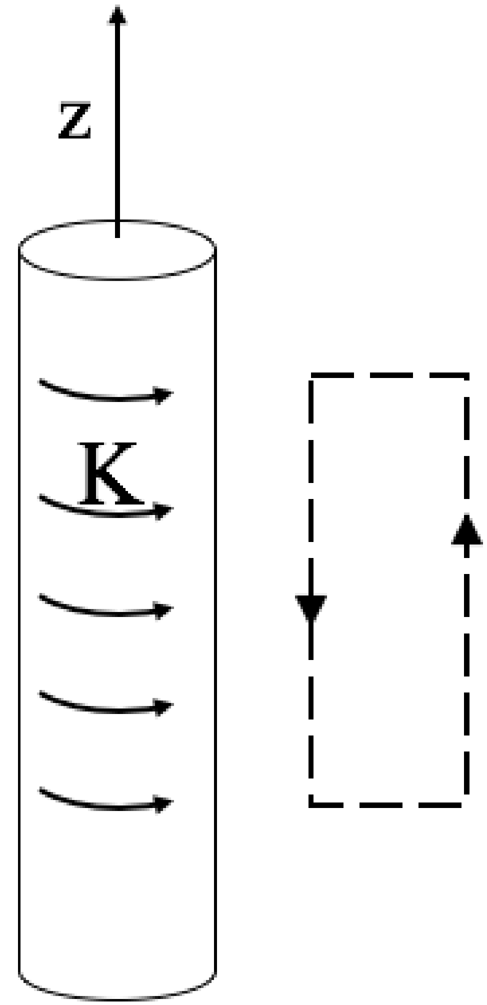
A. $B(z)\,\hat{z}$
B. $B(z)\,\hat{\phi}$
C. $B(s)\,\hat{z}$
D. $B(s)\,\hat{\phi}$
E. Something else?

An infinite solenoid with surface current density K is oriented along the z-axis. Apply Ampere's Law to the rectangular imaginary loop in the yz plane shown. What does this tell you about B_z, the z-component of the B-field outside the solenoid?

A. B_z is constant outside
B. B_z is zero outside
C. B_z is not constant outside
D. It tells you nothing about B_z



An infinite solenoid with surface current density K is oriented along the z-axis. Apply Ampere's Law to the rectangular imaginary loop in the yz plane shown. We can safely assume that $B(s \to \infty) = 0$. What does this tell you about the B-field outside the solenoid?



A. $|\mathbf{B}|$ is a small non-zero constant outside
B. $|\mathbf{B}|$ is zero outside
C. $|\mathbf{B}|$ is not constant outside
D. We still don't know anything about $|\mathbf{B}|$

What do we expect $\mathbf{B}(\mathbf{r})$ to look like for the infinite sheet of current shown below?

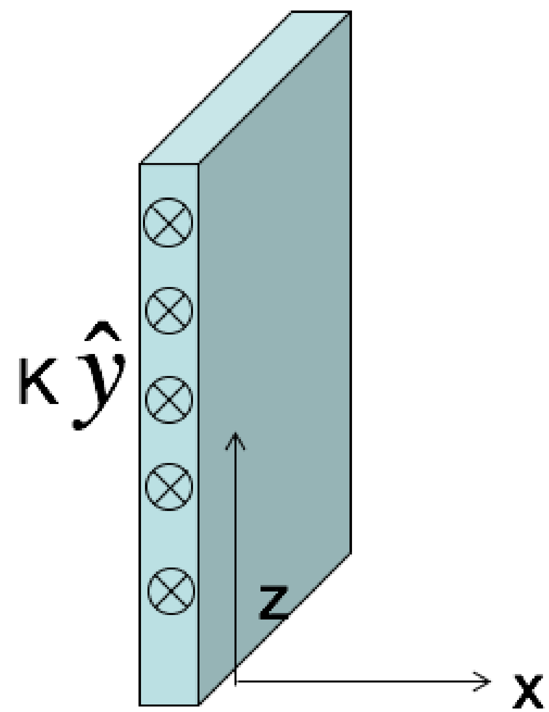
A. $B(x)\hat{x}$

B. $B(z)\hat{x}$

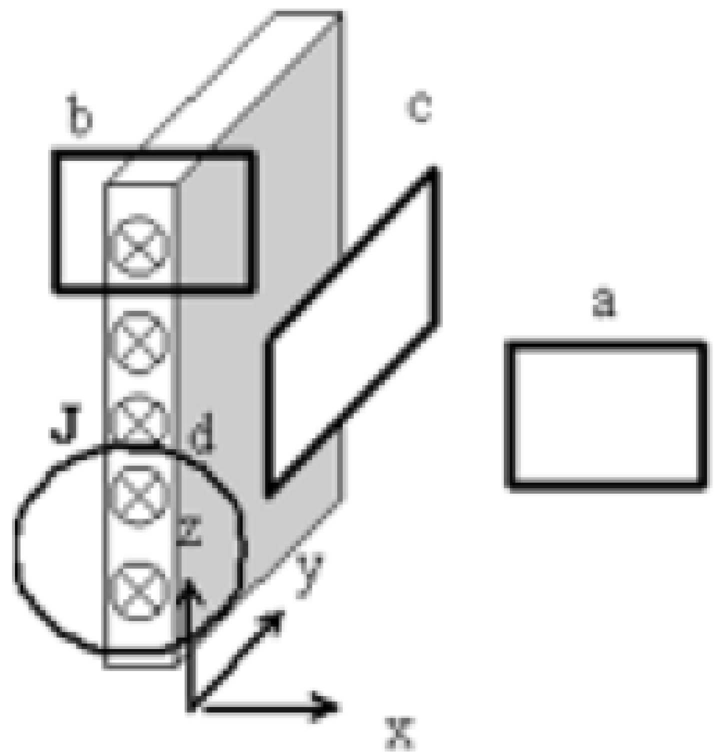
C. $B(x)\hat{z}$

D. $B(z)\hat{z}$

E. Something else



Which Amperian loop are useful to learn about $B(x, y, z)$ somewhere?



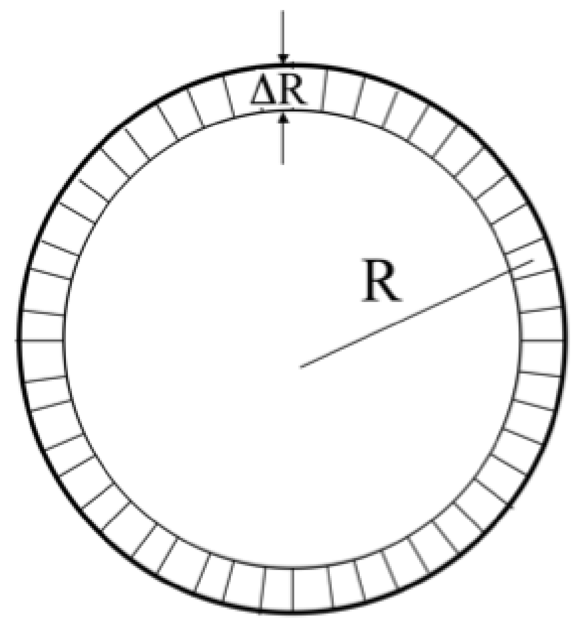
E. More than 1

Gauss' Law for magnetism, $\nabla \cdot \mathbf{B} = 0$ suggests we can generate a potential for $\mathbf{B}$. What form should the definition of this potential take (Φ and $\mathbf{A}$ are placeholder scalar and vector functions, respectively)?

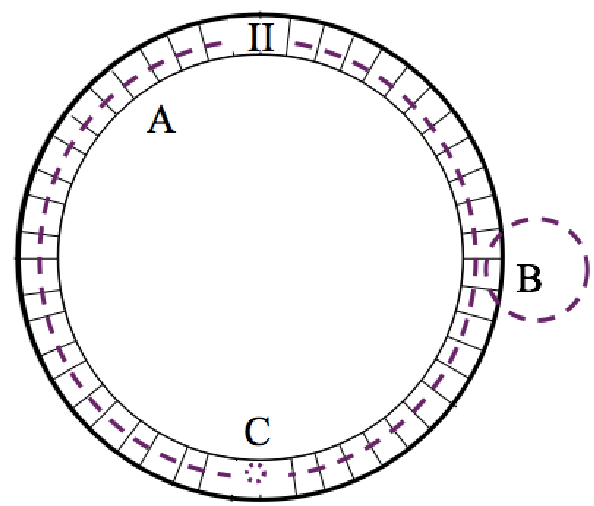
A. $\mathbf{B} = \nabla\Phi$
B. $\mathbf{B} = \nabla \times \Phi$
C. $\mathbf{B} = \nabla \cdot \mathbf{A}$
D. $\mathbf{B} = \nabla \times \mathbf{A}$
E. Something else?!

Consider a toroid, which is like a finite solenoid connected end to end. In which direction do you expect the B field to point?

A. Azimuthally ($\hat{\phi}$ direction)
B. Radially ($\hat{s}$ direction)
C. In the $\hat{z}$ direction (perp. to page)
D. Loops around the rim
E. Mix of the above...



Which Amperian loop would you draw to find B “inside” the Torus (region II)?



A. Large "azimuthal" loop

B. Smallish loop from region II to outside (where B=0)

C. Small loop in region II

D. Like A, but perp to page

E. Something entirely different

With $\nabla^2 \mathbf{A} = -\mu_0 \mathbf{J}$, we can write (in Cartesian coordinates):

$$\nabla^2 A_x = -\mu_0 J_x$$

Does that also mean in spherical coordinates that $\nabla^2 A_r = -\mu_0 J_r$?

A. Yes
B. No

We can compute $\mathbf{A}$ using the following integral:

$$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{\mathfrak{R}} d\tau'$$

Can you calculate that integral using spherical coordinates?

A. Yes, no problem
B. Yes, r' can be in spherical, but $\mathbf{J}$ still needs to be in Cartesian components
C. No.

For a infinite solenoid of radius R, with current I, and n turns per unit length, which is the current density $\mathbf{J}$?

A. $\mathbf{J} = nI\hat{\phi}$
B. $\mathbf{J} = nI\delta(r - R)\hat{\phi}$
C. $\mathbf{J} = \frac{I}{n}\delta(r - R)\hat{\phi}$
D. $\mathbf{J} = \mu_0 nI\delta(r - R)\hat{\phi}$
E. Something else?!