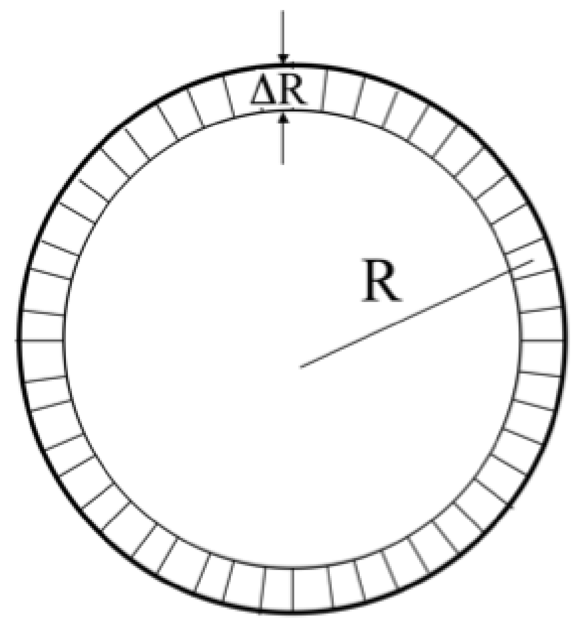
Gauss' Law for magnetism, $\nabla \cdot \mathbf{B} = 0$ suggests we can generate a potential for $\mathbf{B}$. What form should the definition of this potential take (Φ and $\mathbf{A}$ are placeholder scalar and vector functions, respectively)?

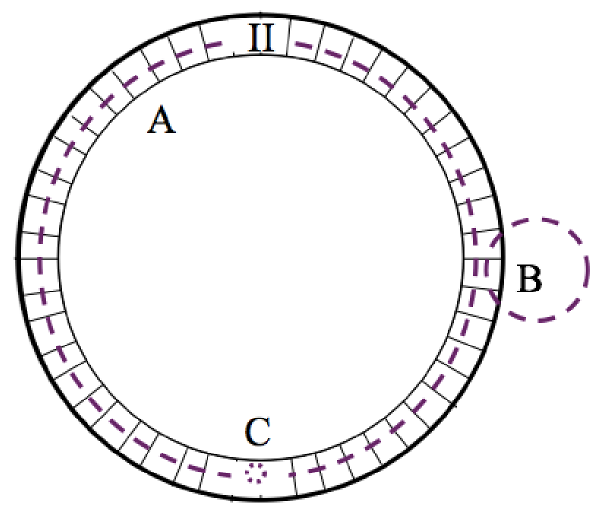
A. $\mathbf{B} = \nabla\Phi$
B. $\mathbf{B} = \nabla \times \Phi$
C. $\mathbf{B} = \nabla \cdot \mathbf{A}$
D. $\mathbf{B} = \nabla \times \mathbf{A}$
E. Something else?!

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?!