What is the physical interpretation of $\oint \mathbf{A} \cdot d\mathbf{l}$?

A. The current density $\mathbf{J}$
B. The magnetic field $\mathbf{B}$
C. The magnetic flux Φ_B
D. It's none of the above, but is something simple and concrete
E. It has no particular physical interpretation at all

Consider a square loop enclosing some amount of magnetic field lines with height H and length L. We intend to compute $\Phi_B = \oint \mathbf{A} \cdot d\mathbf{l}$? What happens to Φ_B as H becomes vanishingly small?

A. Φ_B stays constant
B. Φ_B gets smaller but doesn't vanish
C. $\Phi_B \to 0$

Consider a square loop enclosing some amount of magnetic field lines with height H and length L. If $\Phi_B \to 0$ as $H \to 0$ (or $L \to 0$), what does that say about the continuity of $\mathbf{A}$?

$$\Phi_B = \oint \mathbf{A} \cdot d\mathbf{l}$$

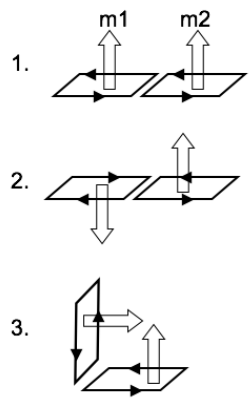
A. $\mathbf{A}$ is continuous at boundaries
B. $\mathbf{A}$ is discontinuous at boundaries
C. ???

The leading term in the vector potential multipole expansion involves:

$$\oint d\mathbf{l}'$$

What is the magnitude of this integral?

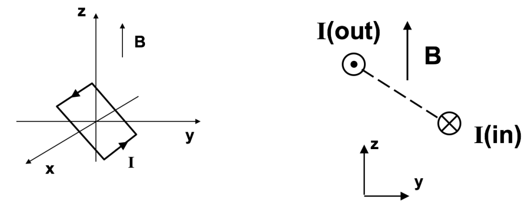
A. R
B. $2\pi R$
C. 0
D. Something entirely different/it depends!



Two magnetic dipoles m_1 and m_2 (equal in magnitude) are oriented in three different ways.

Which ways produce a dipole field at large distances?

A. None of these
B. All three
C. 1 only
D. 1 and 2 only
E. 1 and 3 only



The force on a segment of wire L is $\mathbf{F} = I\mathbf{L} \times \mathbf{B}$

A current-carrying wire loop is in a constant magnetic field $\mathbf{B} = B\hat{z}$ as shown. What is the direction of the torque on the loop?

A. Zero
B. +x
C. +y
D. +z
E. None of these

The torque on a magnetic dipole in a B field is:

$$\tau = \mathbf{m} \times \mathbf{B}$$

How will a small current loop line up if the B field points uniformly up the page?