

What flexibility do we have in defining the vector potential given the Coulomb gauge ($\nabla \cdot \mathbf{A} = 0$)? That is, what can \mathbf{A}' be that gives us the same \mathbf{B} ?

A. $\mathbf{A}' = \mathbf{A} + C$

B. $\mathbf{A}' = \mathbf{A} + \mathbf{C}$

C. $\mathbf{A}' = \mathbf{A} + \nabla C$

D. $\mathbf{A}' = \mathbf{A} + \nabla \cdot \mathbf{C}$

E. Something else?

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

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. $\mathbf{J} = \frac{I}{n}\delta(r - R)\hat{\phi}$

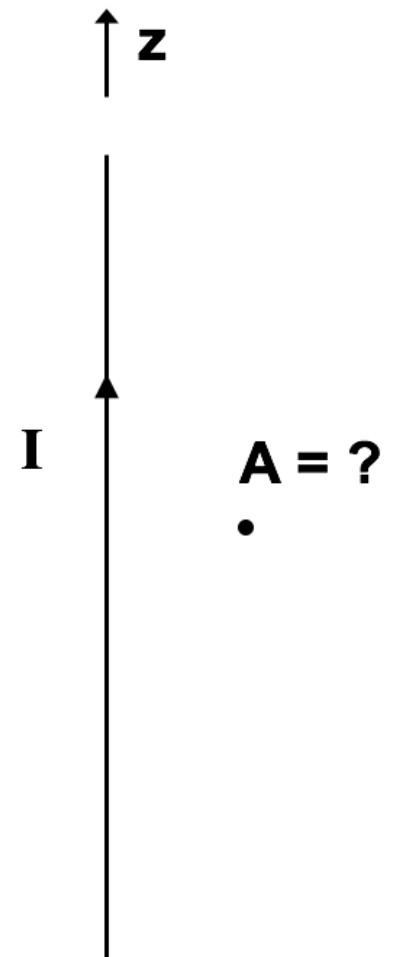
D. $\mathbf{J} = \mu_0 nI\delta(r - R)\hat{\phi}$

E. Something else?!

The vector potential A due to a long straight wire with current I along the z -axis is in the direction parallel to:

- A. \hat{z}
- B. $\hat{\phi}$ (azimuthal)
- C. \hat{s} (radial)

Assume the Coulomb Gauge



Consider a fat wire with radius a with uniform current I_0 that runs along the $+z$ -axis. We can compute the vector potential due to this wire directly. What is \mathbf{J} ?

- A. $I_0/(2\pi)$
- B. $I_0/(\pi a^2)$
- C. $I_0/(2\pi a)\hat{z}$
- D. $I_0/(\pi a^2)\hat{z}$
- E. Something else!?

Consider a fat wire with radius a with uniform current I_0 that runs along the $+z$ -axis. Given $\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{J}(\mathbf{r}')}{\mathfrak{R}} d\tau'$, which components of \mathbf{A} need to be computed?

- A. All of them
- B. Just A_x
- C. Just A_y
- D. Just A_z
- E. Some combination

Consider line of charge with uniform charge density, $\lambda = \rho\pi a^2$. What is the magnitude of the electric field outside of the line charge (at a distance $s > a$)?

A. $E = \lambda/(4\pi\epsilon_0 s^2)$

B. $E = \lambda/(2\pi\epsilon_0 s^2)$

C. $E = \lambda/(4\pi\epsilon_0 s)$

D. $E = \lambda/(2\pi\epsilon_0 s)$

E. Something else?!

Use Gauss' Law

Consider a shell of charge with surface charge σ that is rotating at angular frequency of ω . Which of the expressions below describe the surface current, \mathbf{K} , that is observed in the fixed frame.

A. $\sigma \vec{\omega}$

B. $\sigma \dot{\mathbf{r}}$

C. $\sigma \mathbf{r} \times \vec{\omega}$

D. $\sigma \vec{\omega} \times \mathbf{r}$

E. Something else?