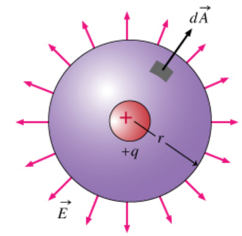
Which of the following are vectors?

(I) Electric field, (II) Electric flux, and/or (III) Electric charge

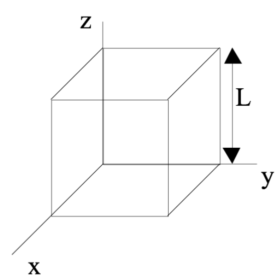
A. I only
B. I and II only
C. I and III only
D. II and III only
E. I, II, and II

GAUSS' LAW



$$\oint_S \mathbf{E} \cdot d\mathbf{A} = \int_V \frac{\rho}{\varepsilon_0} d\tau$$

The space in and around a cubical box (edge length L) is filled with a constant uniform electric field, $\mathbf{E} = E_0\hat{y}$. What is the TOTAL electric flux $\oint_S \mathbf{E} \cdot d\mathbf{A}$ through this closed surface?



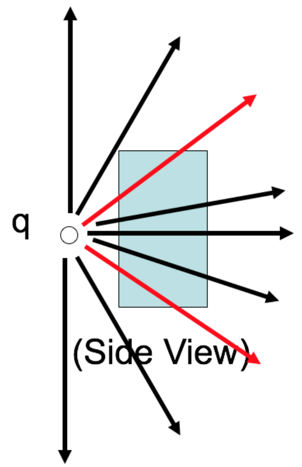
A. 0
B. E_0L^2
C. $2E_0L^2$
D. $6E_0L^2$
E. We don't know $\rho(r)$, so can't answer.

A positive point charge $+q$ is placed outside a closed cylindrical surface as shown. The closed surface consists of the flat end caps (labeled A and B) and the curved side surface (C). What is the sign of the electric flux through surface C?

A. positive
B. negative
C. zero

D. not enough information given to decide

Let's get a better look at the side view.



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B. negative
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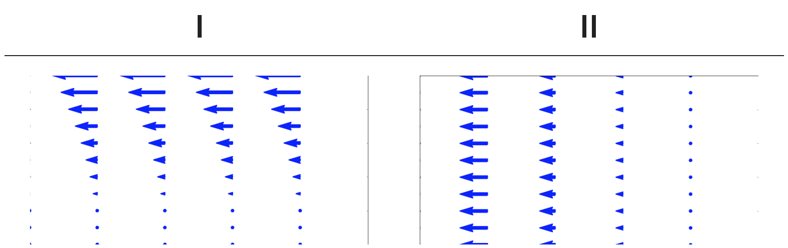
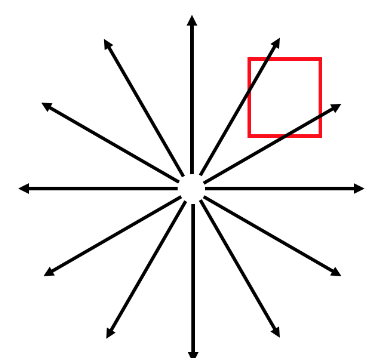
Which of the following two fields has zero divergence?



A. Both do.
B. Only I is zero
C. Only II is zero
D. Neither is zero
E. ???

What is the divergence in the boxed region?

A. Zero
B. Not zero
C. ???

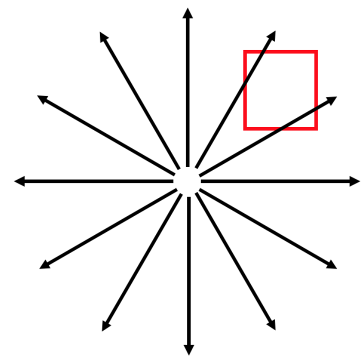


Activity: For a the electric field of a point charge, $\mathbf{E}(\mathbf{r}) = \dfrac{1}{4\pi\varepsilon_0}\dfrac{q}{r^2}\hat{r}$, compute $\nabla \cdot \mathbf{E}$.

Hint: The front fly leaf of Griffiths suggests that the we take:

$$\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2 E_r\right)$$

Remember this?



What is the value of:

$$\int_{-\infty}^{\infty} x^2 \delta(x-2)dx$$

A. 0
B. 2
C. 4
D. ∞
E. Something else

Activity: Compute the following integrals. Note anything special you had to do.

- Row 1-2: $\int_{-\infty}^{\infty} xe^x\delta(x-1)dx$
- Row 3-4: $\int_{\infty}^{-\infty} \log(x)\delta(x-2)dx$
- Row 5-6: $\int_{-\infty}^{0} xe^x\delta(x-1)dx$
- Row 6+: $\int_{-\infty}^{\infty}(x+1)^2\delta(4x)dx$