What is the total charge for this distribution?

$$\rho(\mathbf{r}) = \sum_{k=0}^{2} (1 + k)\, q\, \delta^3(\mathbf{r} - k\mathbf{a})$$

A. q
B. 2 q
C. 4 q
D. 6 q
E. Something else

ANNOUNCEMENTS

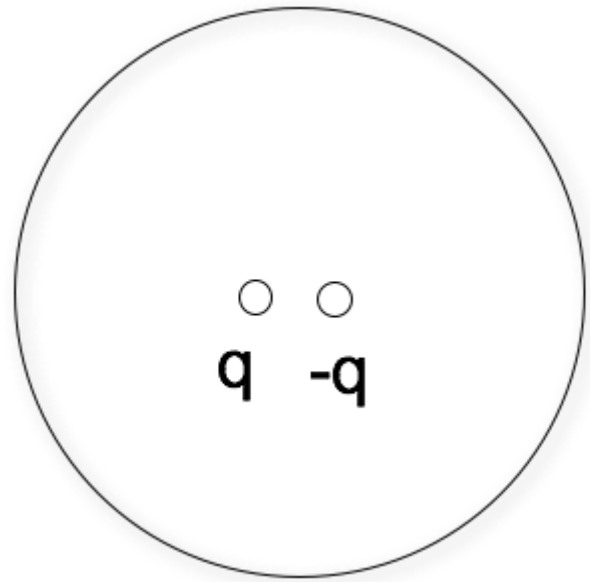
- As requested, Homework 2 grading rubric posted
- Exam 1 is coming up! October 4th (More details next week!)

A Gaussian surface which is *not* a sphere has a single charge (q) inside it, *not* at the center. There are more charges outside. What can we say about total electric flux through this surface $\oint_S \mathbf{E} \cdot d\mathbf{A}$?

A. It is q/ε_0.
B. We know what it is, but it is NOT q/ε_0.
C. Need more info/details to figure it out.

An electric dipole ($+q$ and $-q$, small distance d apart) sits centered in a Gaussian sphere.

What can you say about the flux of $\mathbf{E}$ through the sphere, and $|\mathbf{E}|$ on the sphere?



A. Flux = 0, E = 0 everywhere on sphere surface
B. Flux = 0, E need not be zero *everywhere* on sphere
C. Flux is not zero, E = 0 everywhere on sphere
D. Flux is not zero, E need not be zero...

Tutorial follow-up:

Does the charge σ on the beam line affect the particles being accelerated inside it?

A. Yes
B. No
C. ???

Think: Why? Or why not?

Tutorial follow-up:

Could the charge σ affect the electronic equipment outside the tunnel?

A. Yes
B. No
C. ???

Think: Why? Or why not?

We derived that the electric field due to an infinite sheet with charge density σ was as follows:

$$\mathbf{E}(z) = \begin{cases} \dfrac{\sigma}{2\varepsilon_0}\hat{k} & \text{if} \quad z > 0 \\ \dfrac{-\sigma}{2\varepsilon_0}\hat{k} & \text{if} \quad z < 0 \end{cases}$$

What does that tell you about the difference in the field when we cross the sheet, $\mathbf{E}(+z) - \mathbf{E}(-z)$?

A. it's zero

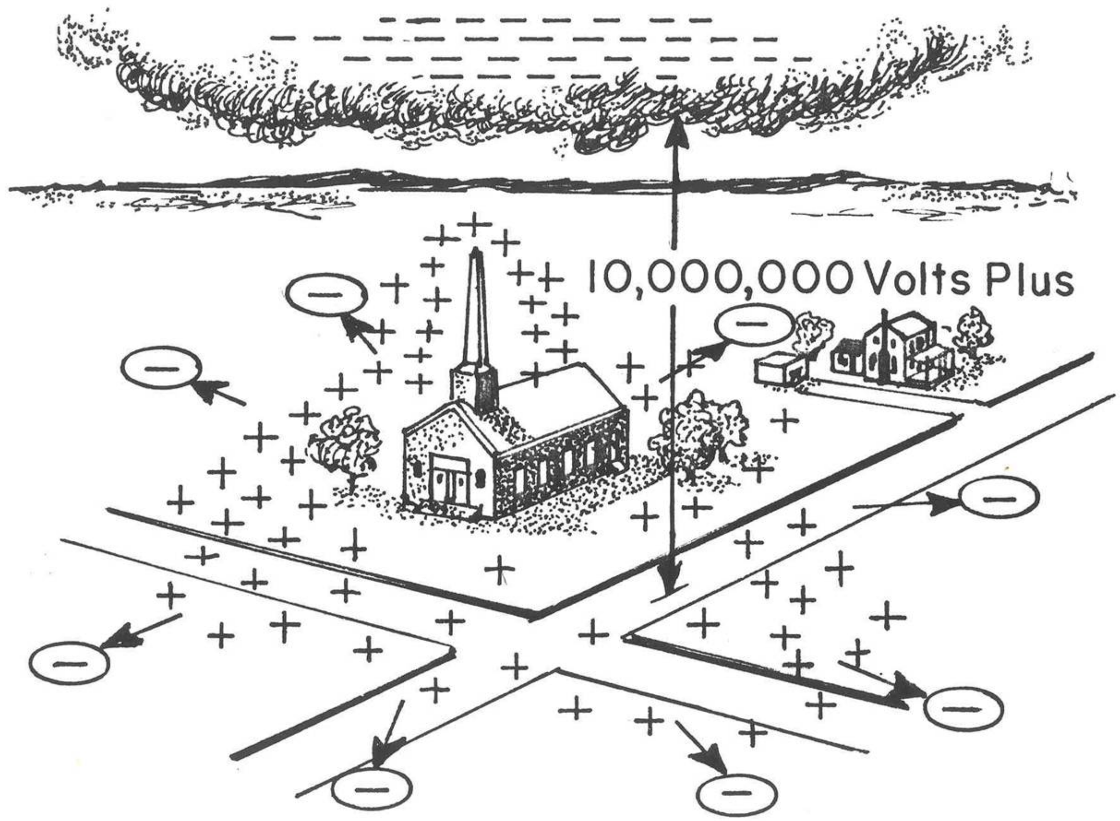
B. it's $\frac{\sigma}{\varepsilon_0}$

C. it's -$\frac{\sigma}{\varepsilon_0}$

D. it's +$\frac{\sigma}{\varepsilon_0}\hat{k}$

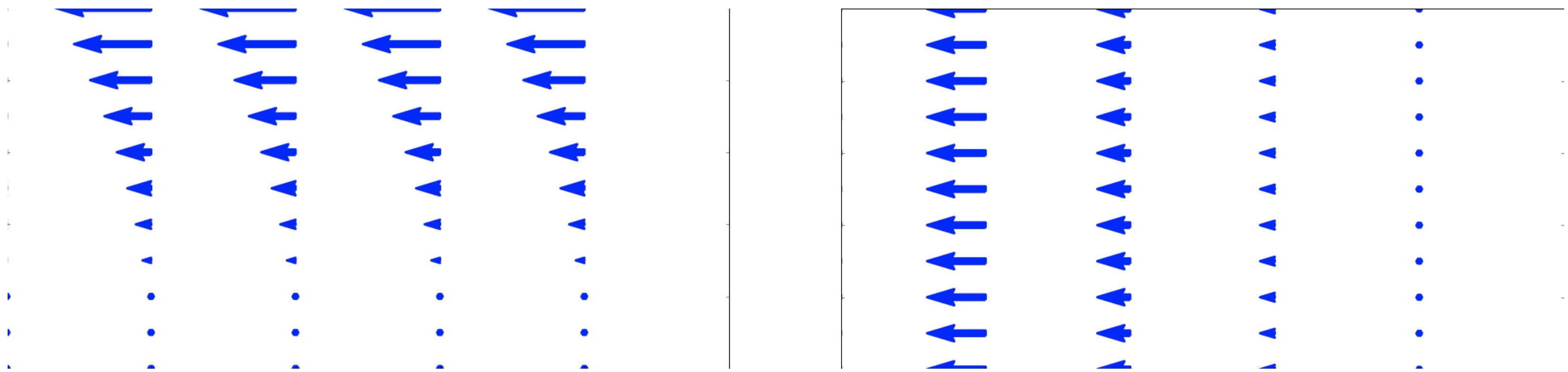
E. it's -$\frac{\sigma}{\varepsilon_0}\hat{k}$

ELECTRIC POTENTIAL



Which of the following two fields has zero curl?

I	II



A. Both do.

B. Only I is zero

C. Only II is zero

D. Neither is zero

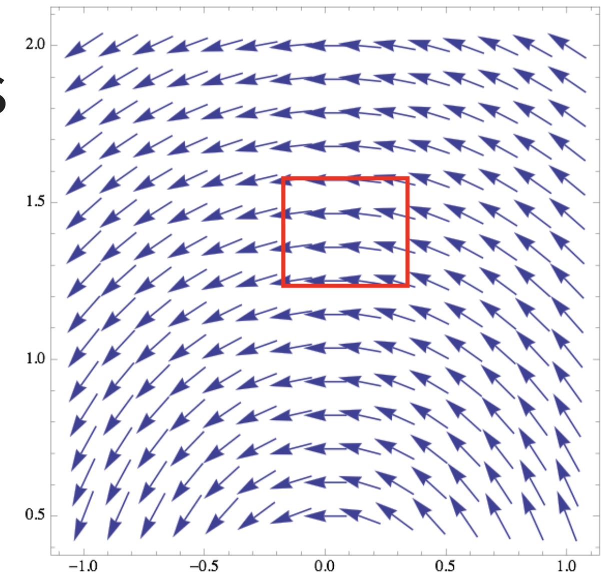
E. ???

What is the curl of the vector field, $\mathbf{v} = c\hat{\phi}$, in the region shown below?

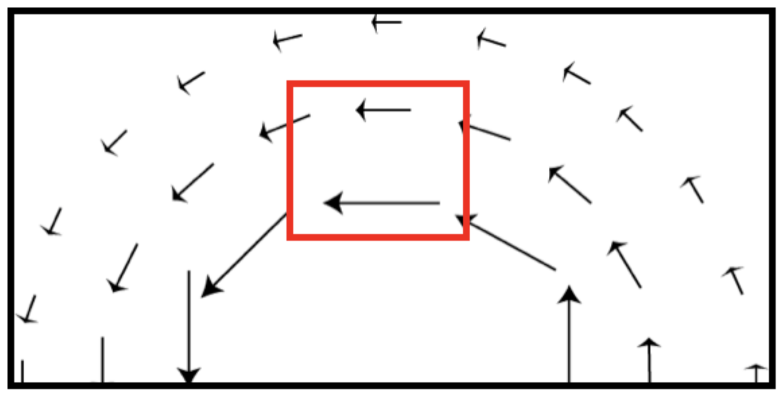
A. non-zero everywhere

B. zero at some points, non-zero at others

C. zero curl everywhere

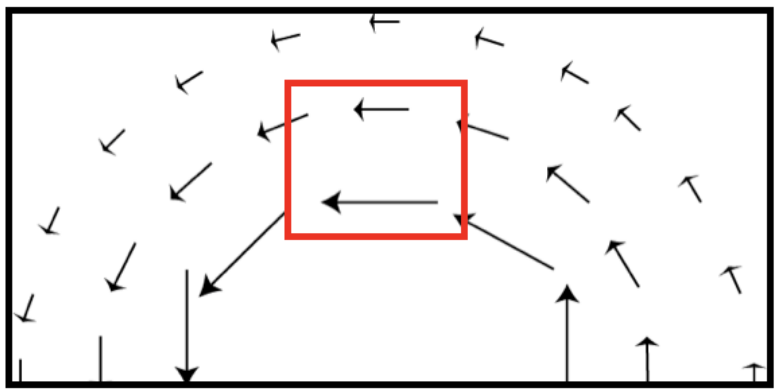


What is the curl of this vector field, in the red region shown below?



A. non-zero everywhere in the box
B. non-zero at a limited set of points
C. zero curl everywhere shown
D. we need a formula to decide

What is the curl of this vector field, $\mathbf{v} = \frac{c}{s}\hat{\phi}$, in the red region shown below?



A. non-zero everywhere in the box

B. non-zero at a limited set of points

C. zero curl everywhere shown

Is it mathematically ok to do this?

$$\mathbf{E} = \frac{1}{4\pi\varepsilon_0}\int_V \rho(\mathbf{r}')d\tau' \left(-\nabla\frac{1}{\mathfrak{R}}\right)$$

$$\longrightarrow \mathbf{E} = -\nabla\left(\frac{1}{4\pi\varepsilon_0}\int_V \rho(\mathbf{r}')d\tau' \frac{1}{\mathfrak{R}}\right)$$

A. Yes

B. No

C. ???

If $\nabla \times \mathbf{E} = 0$, then $\oint_C \mathbf{E} \cdot d\mathbf{l} =$

A. 0

B. something finite

C. ∞

D. Can't tell without knowing C

Can superposition be applied to electric potential, V?

$$V_{tot} \stackrel{?}{=} \sum_i V_i = V_1 + V_2 + V_3 + \ldots$$

A. Yes

B. No

C. Sometimes