Consider a spherical Gaussian surface. What is the $d\mathbf{A}$ in $\int\int \mathbf{E} \cdot d\mathbf{A}$?

A. $r d\theta d\phi \hat{r}$

B. $r^2 d\theta d\phi \hat{r}$

C. $r \sin\theta d\theta d\phi \hat{r}$

D. $r^2 \sin\theta d\theta d\phi \hat{r}$

E. Something else

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

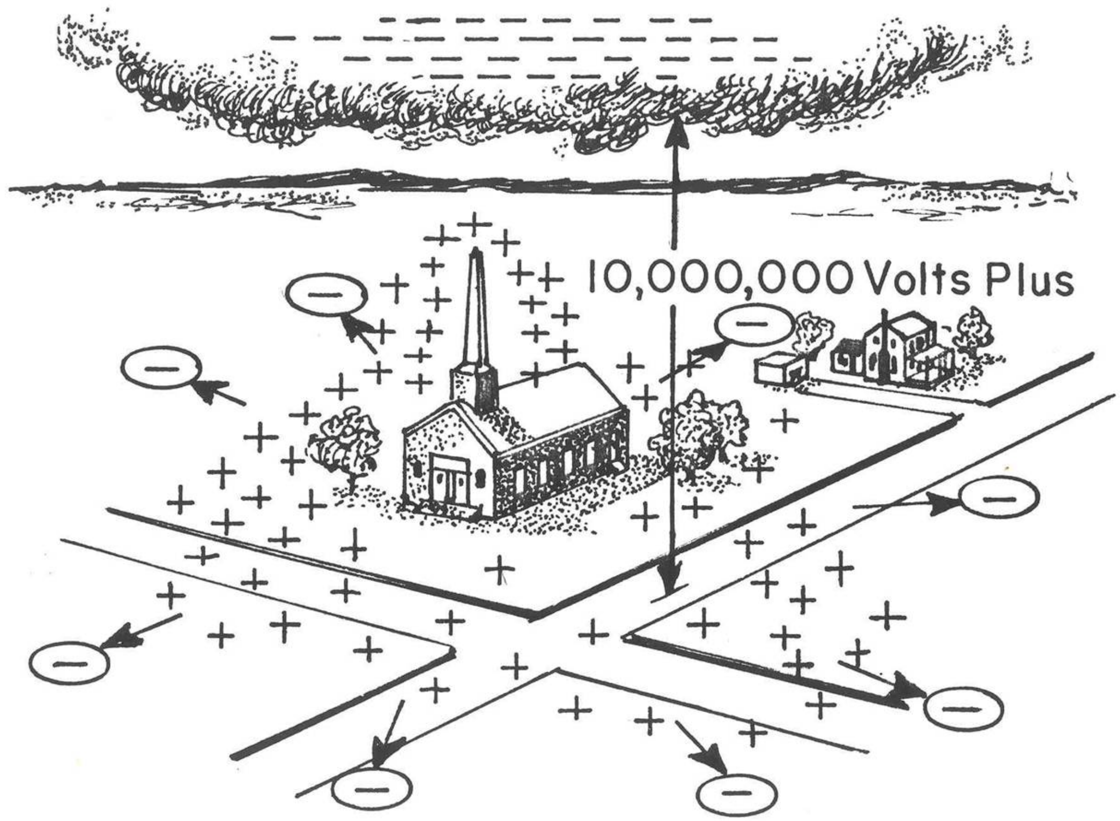
B. it's $\frac{\sigma}{\varepsilon_0}$

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

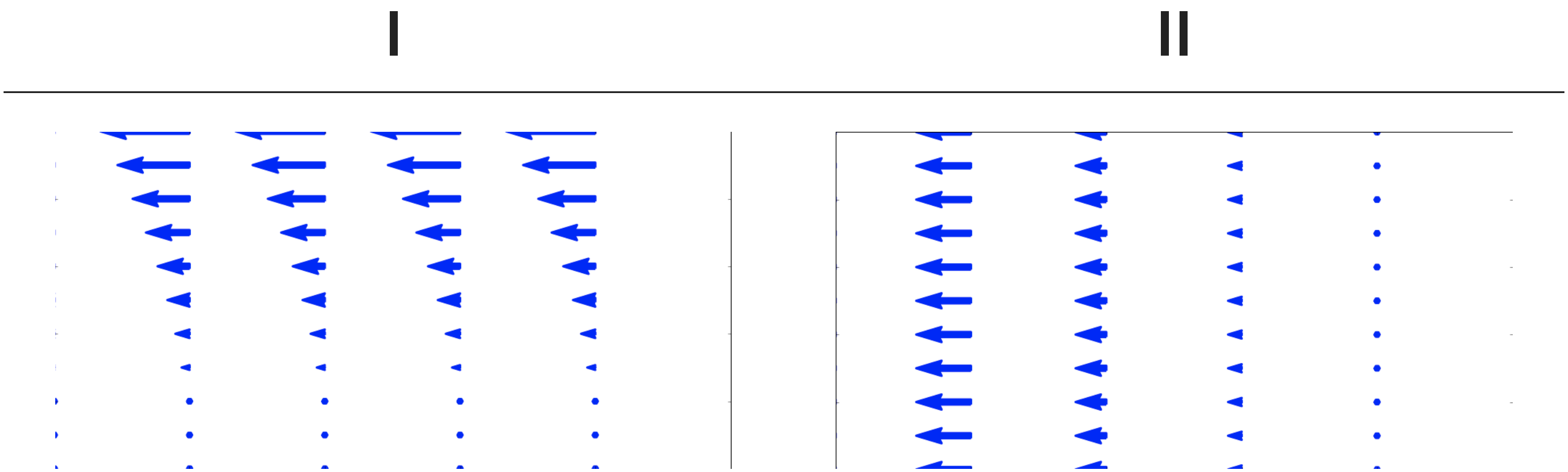
D. it's +$\frac{\sigma}{\varepsilon_0}\hat{k}$

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

ELECTRIC POTENTIAL



Which of the following two fields has zero curl?



A. Both do.

B. Only I is zero

C. Only II is zero

D. Neither is zero

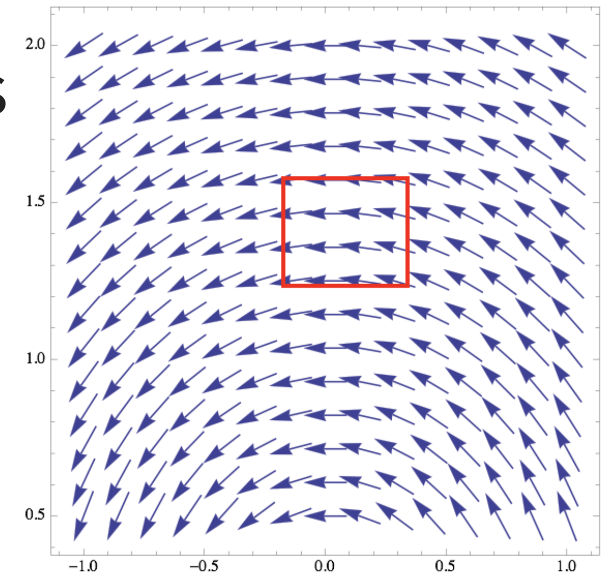
E. ???

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

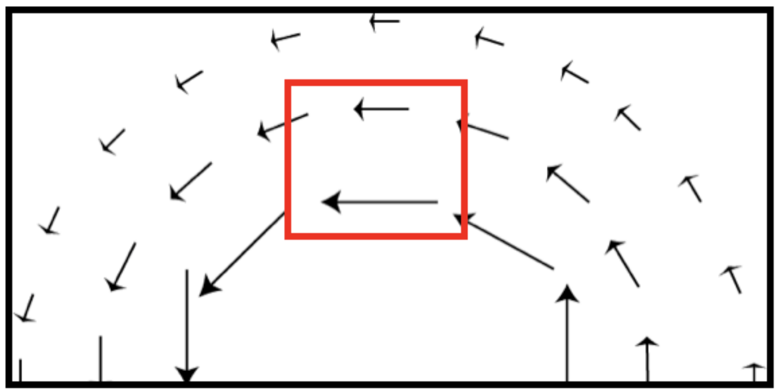
A. non-zero everywhere

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

C. zero curl everywhere

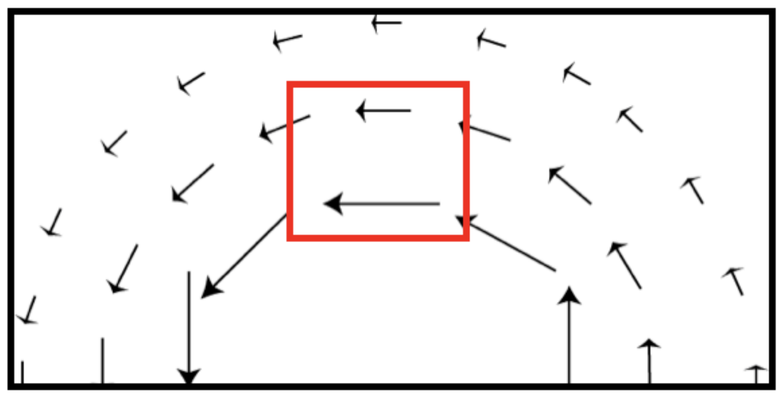


What is the curl of this vector field, in the red region shown below?



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