Consider a cube of constant charge density centered at the origin.

True or False: I can use Gauss' Law to find the electric directly above the center of the cube.

A. True and I can argue how we'd do it.
B. True. I'm sure we can, but I don't see how to just yet.
C. False. I'm pretty sure we can't, but I can't say exactly why.
D. False and I can argue why we can't do it.

ANNOUNCEMENTS

- First week for clickers is this week
  - I will drop the 3 lowest clicker grades
- Homework 2 (due Wed.)
  - No need to do Problem 5 (will be problem 1 on HW 4)
  - BTW, I will drop your lowest homework grade

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+: $\int_{-\infty}^{\infty} (x+1)^2 \delta(4x)dx$

Compute:

$$\int_{-\infty}^{\infty} x^2 \delta(3x + 5)\,dx$$

A. 25/3

B. −5/3

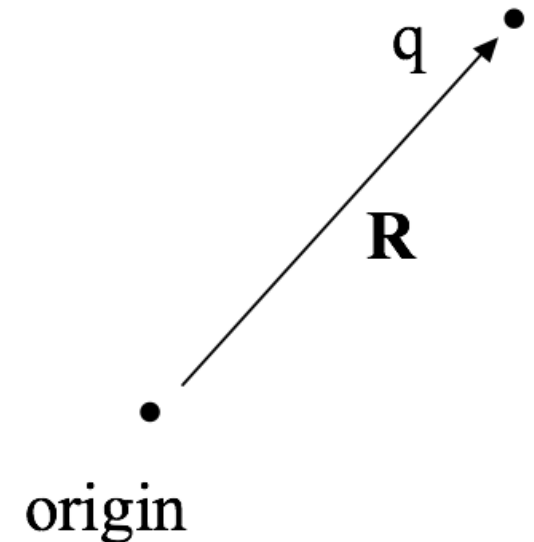C. 25/27

D. 25/9

E. Something else

A point charge (q) is located at position $\mathbf{R}$, as shown. What is $\rho(\mathbf{r})$, the charge density in all space?

A. $\rho(\mathbf{r}) = q\delta^3(\mathbf{R})$
B. $\rho(\mathbf{r}) = q\delta^3(\mathbf{r})$
C. $\rho(\mathbf{r}) = q\delta^3(\mathbf{R} - \mathbf{r})$
D. $\rho(\mathbf{r}) = q\delta^3(\mathbf{r} - \mathbf{R})$
E. Something else??

q

$\mathbf{R}$

origin

What are the units of $\delta(x)$ if x is measured in meters?

A. $\delta(x)$ is dimension less ('no units')
B. $[m]$: Unit of length
C. $[m^2]$: Unit of length squared
D. $[m^{-1}]$: 1 / (unit of length)
E. $[m^{-2}]$: 1 / (unit of length squared)

What are the units of $\delta^3(\mathbf{r})$ if the components of $\mathbf{r}$ are measured in meters?

A. [m]: Unit of length
B. [m^2]: Unit of length squared
C. [m^{-1}]: 1 / (unit of length)
D. [m^{-2}]: 1 / (unit of length squared)
E. None of these.

What is the divergence in the boxed region?

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