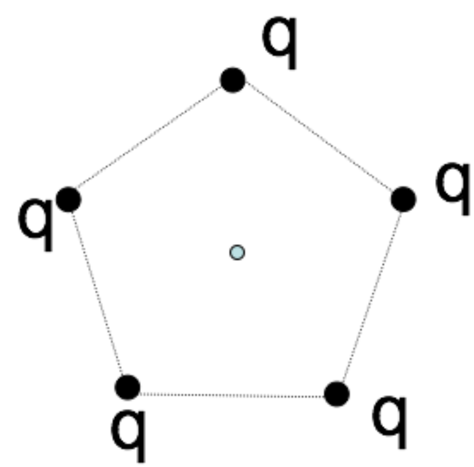
5 charges, q, are arranged in a regular pentagon, as shown. What is the E field at the center?



A. Zero

B. Non-zero

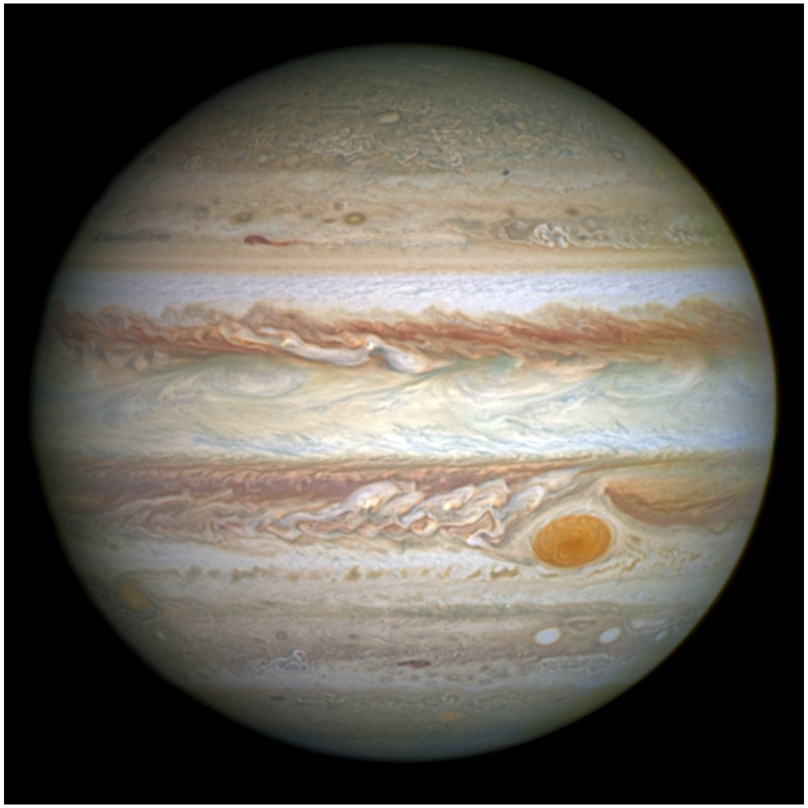
C. Really need trig and a calculator to decide

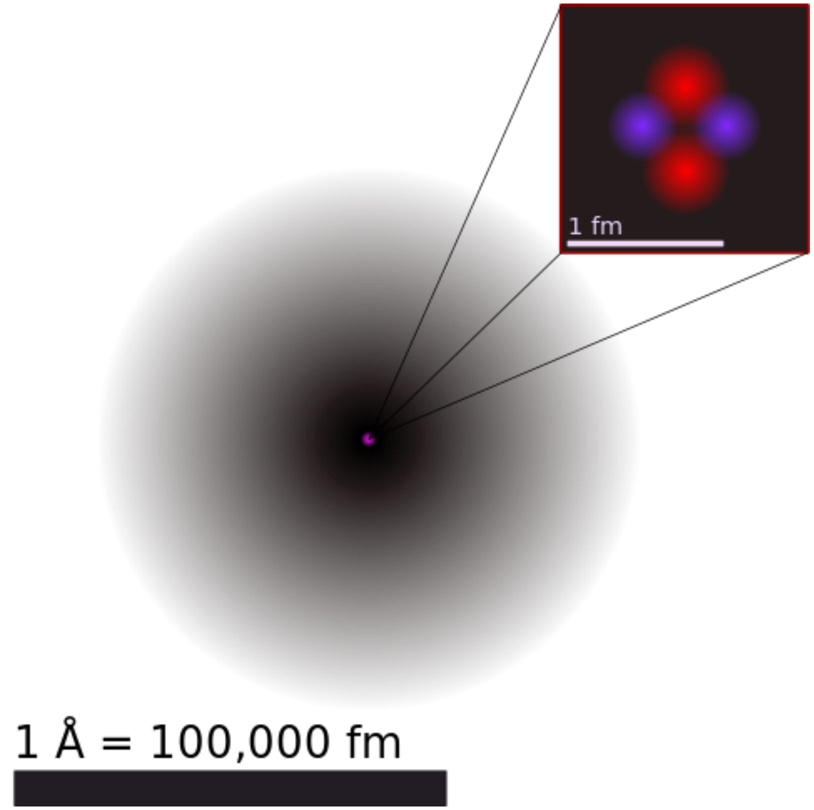
MORE SHAMING

REGISTER YOUR CLICKER

- Bloomfield, Brandon
- Everett, Nathan
- Klebba, Jared
- Verleye, Erick
- Wu, Madeleine
- Xu, Fu

CLASSICAL ELECTROMAGNETISM

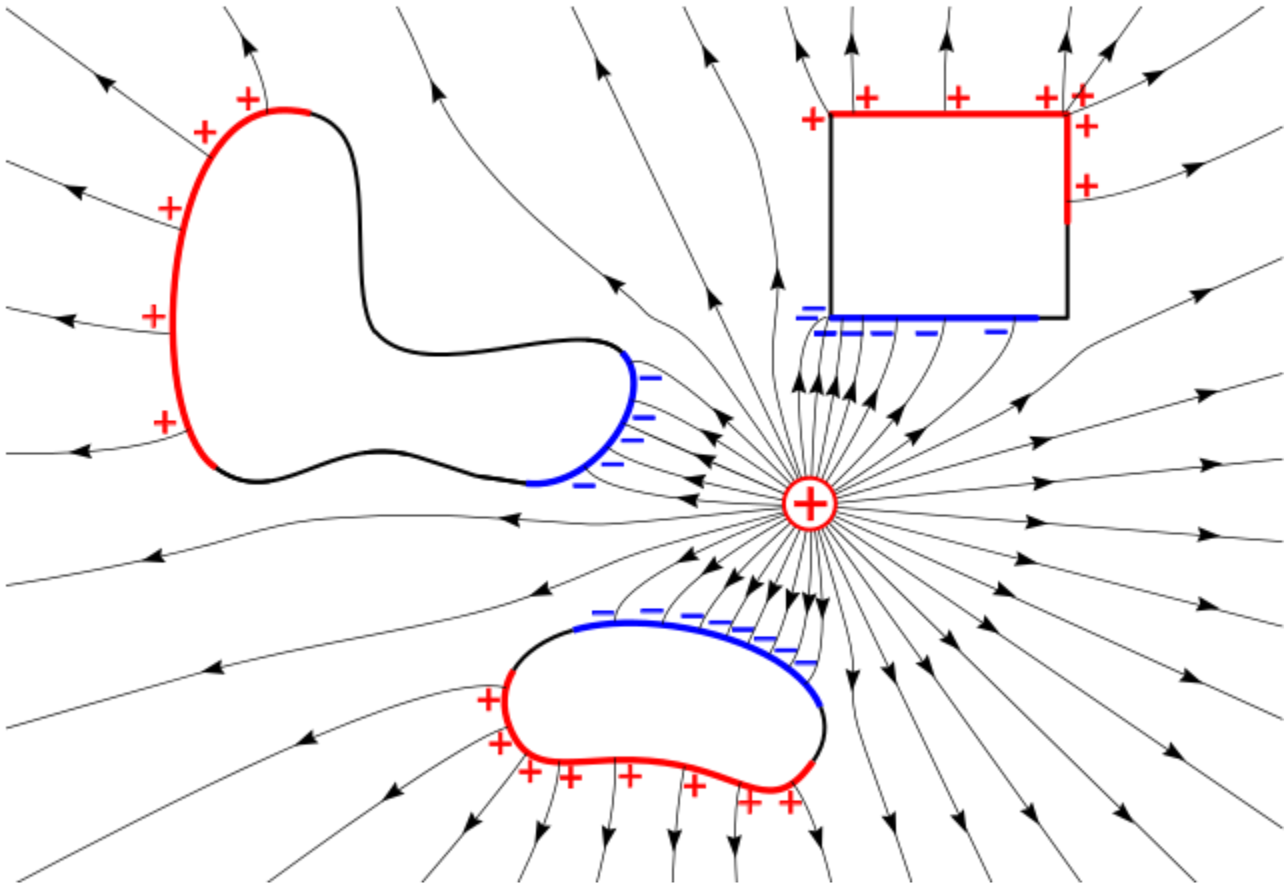




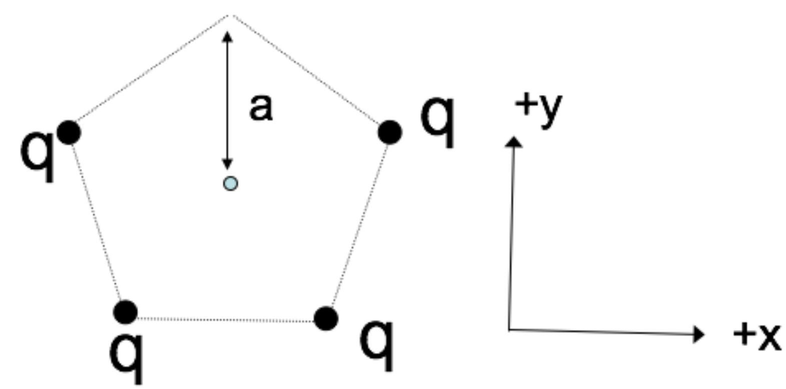
$$\sim 10^{8}\mathrm{m} \longrightarrow\longrightarrow\longrightarrow\longrightarrow\longrightarrow\longrightarrow \sim 10^{-16}\mathrm{m}$$

24 orders of magnitude

ELECTROSTATICS



1 of the 5 charges has been removed, as shown. What's the E field at the center?



A. $+(kq/a^2)\hat{y}$
B. $-(kq/a^2)\hat{y}$
C. 0
D. Something entirely different!
E. This is a nasty problem which I need more time to solve

If all the charges live on a line (1-D), use:

$$\lambda \equiv \frac{\text{charge}}{\text{length}}$$

Draw your own picture. What's $\mathbf{E}(\mathbf{r})$?

To find the E-field at P from a thin line (uniform charge density λ):

$$\mathbf{E}(\mathbf{r}) = \frac{1}{4\pi\varepsilon_0}\int \frac{\lambda dl'}{\mathfrak{R}^2}\hat{\mathfrak{R}}$$

What is $\mathfrak{R}$?

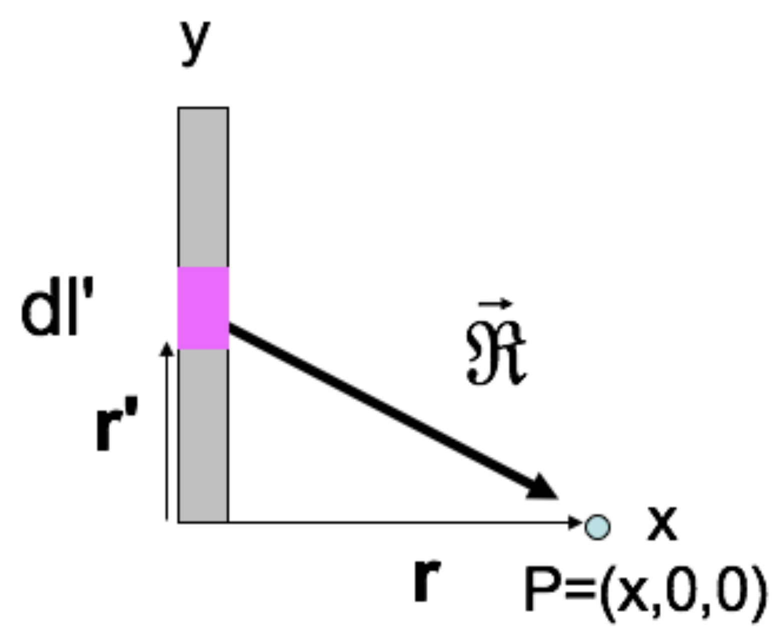
A. x

B. y'

C. $\sqrt{dl'^2 + x^2}$

D. $\sqrt{x^2 + y'^2}$

E. Something else



$$\mathbf{E}(\mathbf{r}) = \int \frac{\lambda dl'}{4\pi\varepsilon_0 \mathfrak{R}^3}\vec{\mathfrak{R}}, \text{ so: } E_x(x,0,0) = \frac{\lambda}{4\pi\varepsilon_0}\int \ldots$$

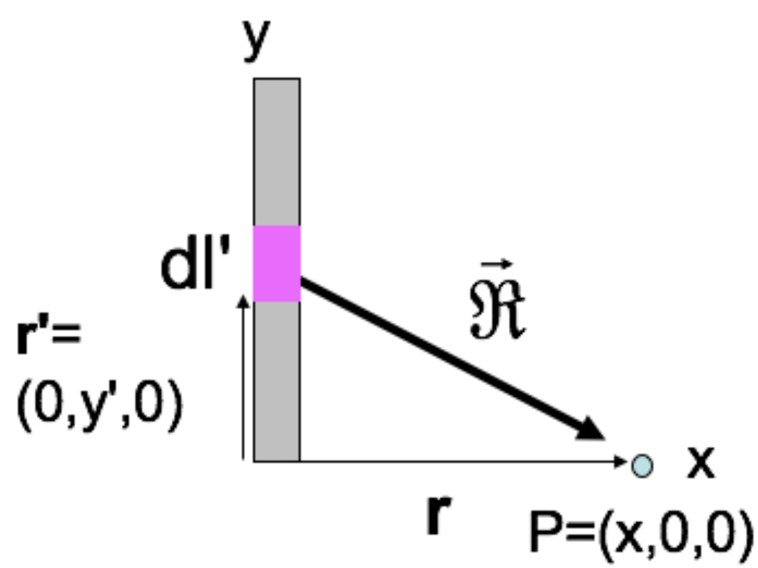
A. $\int \frac{dy' x}{x^3}$

B. $\int \frac{dy' x}{(x^2 + y'^2)^{3/2}}$

C. $\int \frac{dy' y'}{x^3}$

D. $\int \frac{dy' y'}{(x^2 + y'^2)^{3/2}}$

E. Something else



What do you expect to happen to the field as you get really far from the rod?

$$E_x = \frac{\lambda}{4\pi\varepsilon_0} \frac{L}{x\sqrt{x^2 + L^2}}$$

A. E_x goes to 0.

B. E_x begins to look like a point charge.

C. E_x goes to ∞.

D. More than one of these is true.

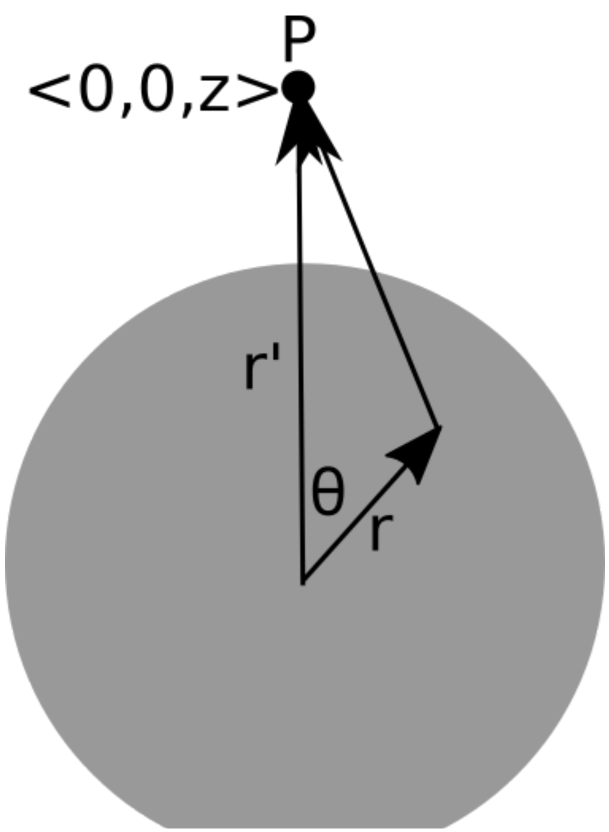
E. I can't tell what should happen to E_x.

Activity:

You determine that a particular electrostatics problem cannot be integrated analytically. How do you instruct a computer to do it for you?

Work with those around you to come up with a series of instructions (in plain words) to tell the computer to do it.

Given the location of the little bit of charge (dq), what is $|\vec{\mathfrak{R}}|$?



A. $\sqrt{z^2 + r'^2}$
B. $\sqrt{z^2 + r'^2 - 2zr' \cos\theta}$
C. $\sqrt{z^2 + r'^2 + 2zr' \cos\theta}$
D. Something else