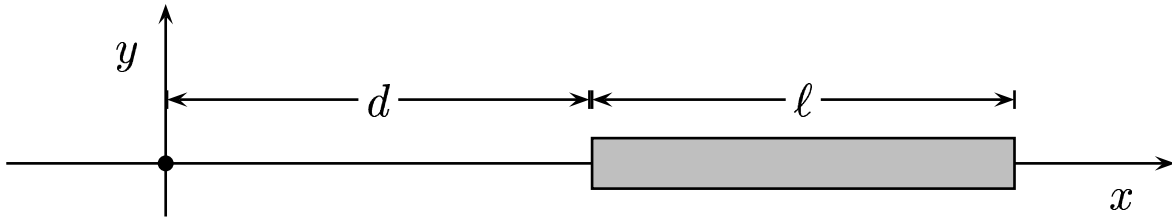


A rod with linear charge density $\lambda < 0$ and length ℓ lies along the x -axis with its left-hand end a distance d from the origin.



By inspection \vec{E} is pointing along the positive x -axis, since the charge on the rod is negative $\lambda < 0$.

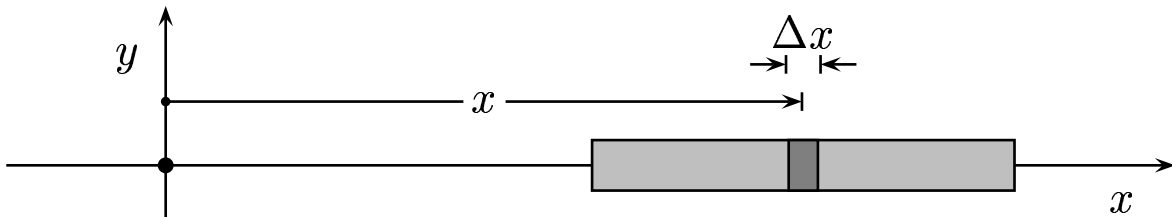
What is the magnitude of the electric field at the origin?

A) $\|\vec{E}\| = k \lambda \int_d^{d+\ell} \frac{1}{x^2} dx$

B) $\|\vec{E}\| = k \lambda \int_d^{\ell} \frac{1}{x^2} dx$

C) $\|\vec{E}\| = \frac{k}{\lambda} \int_d^{d+\ell} \frac{1}{x^2} dx$

D) $\|\vec{E}\| = \frac{k}{\lambda} \int_d^{\ell} \frac{1}{x^2} dx$



$$\begin{aligned} \text{Since } \Delta E &= k \frac{\Delta Q}{x^2} \quad \text{and} \quad \Delta Q = \lambda \Delta x \\ &= k \frac{\lambda \Delta x}{x^2}, \quad \text{so} \end{aligned}$$

$$\begin{aligned} E &= \int \Delta E \\ &= k \lambda \int_d^{d+\ell} \frac{1}{x^2} dx. \end{aligned}$$

Answer **A**.