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

By inspection $\vec{E}$ is pointing along the positive $x$-axes, 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) $||\vec{E}|| = \frac{k}{\lambda} \int_d^{\ell} \frac{1}{x^2} \, dx$

Since $\Delta E = k \frac{\Delta Q}{x^2}$ and $\Delta Q = \lambda \Delta x$

\[ E = \int \Delta E \]

\[ = k \lambda \int_d^{d+\ell} \frac{1}{x^2} \, dx. \]

Answer A.

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