Coaxial Cable. (Your cable TV!)

![Diagram of coaxial cable]

Insulating support (+tension) no net change

Uniform positive charge/ unit length = \( \lambda \)

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Calculate the electric field \( E \)

(a) At any pt. between the cylinders a distance \( r \) from the axis. (See Example 22-6 p. 850-1)

Between the cylinders, \( a \leq r \leq b \)

\[
E = \frac{k(2\lambda)}{2\pi \varepsilon_0 r} = \frac{1}{4\pi \varepsilon_0} \frac{2\lambda}{r}
\]

Table on p. 860-1

(b) At any pt. outside the outer cylinder, i.e., \( r > c \).

The enclosed charge is still the same, so

\[ E = \frac{k(2\lambda)}{r} \text{ again} \]

(c) Draw a graph of \( E \) as a function of \( r \) from \( r = 0 \) to \( r = 2c \)

(d) Find the charge/unit length on the inner and outer surfaces of the outer cylinder.

The inner and outer surfaces must have some charge on them.

\[ \lambda = -\lambda_{\text{inner}} \quad \Rightarrow \quad \lambda_{\text{inner}} = -\lambda \]

And then \( \lambda_{\text{outer}} = \lambda \)