

Exercise 43

Chapter 2, Page 107

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Introduction to Electrodynamics

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Let the inner cylinder have line charge distribution of λ . The electric field is then:

$$\vec{E} = \frac{\lambda}{2\pi\epsilon_0 s} \hat{s}$$

The potential difference is then:

$$V(b) - V(a) = - \int_a^b E ds = - \frac{\lambda}{2\pi\epsilon_0} \ln \frac{b}{a}$$

The capacitance per unit length is then:

$$\frac{C}{L} = \frac{\lambda L}{\Delta V L} = \boxed{\frac{2\pi\epsilon_0}{\ln(b/a)}}$$

Result

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$$\boxed{\frac{C}{L} = \frac{\lambda L}{\Delta V L} = \frac{2\pi\epsilon_0}{\ln(b/a)}}$$

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