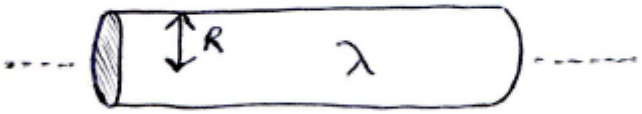
Problem discussed in the videos:

2. Electrostatics II: Gauss' Law. An infinitely long insulating cylinder of radius R carries uniform charge per unit length λ, as shown in Figure 2.

a) Find the magnitude and direction of the electric field $\boldsymbol{E}$ as a function of distance r from the cylindrical axis, for $r < R$. Express the answer in terms of $\{\varepsilon_0, \lambda, R, r\}$.
b) Find the magnitude and direction of the electric field $\boldsymbol{E}$ as a function of distance r from the cylindrical axis, for $r > R$. Express the answer in terms of $\{\varepsilon_0, \lambda, r\}$.
c) Sketch the electric field magnitude E as a function of r for all r.
d) Find the magnitude and direction of the force $\boldsymbol{F}_{elec}$ on an election ($q = -e$, $m = m_e$) placed at a distance $r = 2R$ from the cylindrical axis. Express the answer in terms of $\{\varepsilon_0, \lambda, e, r\}$.
e) If the electron is released from rest at $r = 2R$, how fast is it moving when it reaches the cylinder? Express the answer in terms of $\{\varepsilon_0, \lambda, e, m_e\}$.

FIGURE 2.



$\lambda = \frac{\text{chg}}{\text{length}}$