Electric Field of Charged Rod (1)

- Charge per unit length: \( \lambda = \frac{Q}{L} \)
- Charge on slice \( dx \): \( dq = \lambda \, dx \)

Electric field generated by slice \( dx \): 
\[
E = k \lambda \int_D^{D+L} \frac{dx}{x^2} = k \lambda \left[ -\frac{1}{x} \right]_D^{D+L} = k \lambda \left[ \frac{1}{D} - \frac{1}{D+L} \right] = \frac{kQ}{D(D+L)}
\]

- Limiting case of very short rod (\( L \ll D \)): \( E \approx \frac{kQ}{D^2} \)
- Limiting case of very long rod (\( L \gg D \)): \( E \approx \frac{k\lambda}{D} \)