

4.4 If the line charge density is given by $\rho_l = 24y^2$ (mC/m), find the total charge distributed on the y-axis from $y = -5$ to $y = 5$.

Solution:

$$Q = \int_{-5}^5 \rho_l \, dy = \int_{-5}^5 24y^2 \, dy = \left. \frac{24y^3}{3} \right|_{-5}^5 = 2000 \text{ mC} = 2 \text{ C}.$$
