Electric Potential / Voltage

Reading assignment

Popović and Popović, Chapter 4
Connor and Salon, II-10 → II-26

Problem 1 - Determine V from E

a. Take the electric field from Lesson 2.2, Problem 3. Assume that the outer cylinder is grounded.

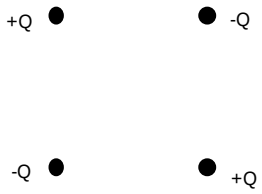
a. Find the voltage as a function of r for $r > b$ and $b > r > a$.

b. Check your result by evaluating - V.

c. Find the voltage at r=0.

Problem 2 - Equipotential lines

Plot a set of electric field lines and equipotential lines for the quadrupole set of charges below. Dipole equipotentials can be viewed with the Mathcad worksheet for 3.6.2.



Problem 3 - Find V from charge

a. Find the electric potential at z = 0 as a function of r due to a line charge ρ_l that extends from z = -L / 2 -> L / 2. You'll probably want to use Maple.

b. Find the **E** at the same locations.

c. When $\rho_l = 10^{-10}$ C / m and L = 0.2 m, numerically evaluate V at r = 0.1 m, and **E** at r = 0.105 m.

d. Approximate the line charge as a set of 4 point charges. Calculate the voltage from the 4 point charges and compare with part c.

e. Calculate the voltage at r = 0.11 m, and use this to estimate the electric field at r = 0.105 m.