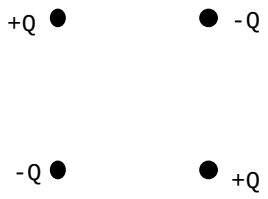
Electric Potential / Voltage

Reading assignment
Ulaby, 4-5
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.