**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 \(-\nabla V\).
   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.

![Quadrupole Charges](image)

**Problem 3 - Find V from charge**

a. Find the electric potential at \( z = 0 \) as a function of \( r \) due to a line charge \( \rho_l \) that extends from \( z = -L/2 \) to \( L/2 \). You'll probably want to use Maple.
   b. Find the \( E \) at the same locations.
   c. When \( \rho_l = 10^{-10} \text{ C/m} \) and \( L = 0.2 \text{ m} \), numerically evaluate \( V \) at \( r = 0.1 \text{ m} \), and \( E \) at \( r = 0.105 \text{ m} \).
   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 \( r = 0.11 \text{ m} \), and use this to estimate the electric field at \( r = 0.105 \text{ m} \).