

## Coulomb's law and charge

**Reading assignment**

Popović and Popović, Chapter 3  
Connor and Salon, I-16 → I-24

**Software**

Java applet on E of point charges - linked from Course Schedule

**Problem 1 - Charge density**

- a. Find the charge in the spherical volume  $r \leq a$  containing a charge distribution  $\rho = \rho_0 r^2/a^2$ . Evaluate the result analytically. Then find a numerical result when  $a = 2$  meters and  $\rho_0 = 10^{-6} \text{ C/m}^3$ .
- b. A surface charge on a disk increases linearly from  $\rho_s = 0$  in the center to  $\rho_s = 4 \times 10^{-6} \text{ C/m}^2$  at the outer edge where  $r = 2$  meters. Find the total charge on the disk.

**Problem 2 - Electric field lines & Coulomb's law**

Sketch the electric field lines for the electric quadrupole shown below.

Across what planes do you expect the field to be symmetric? *After completing your sketch*, verify your result with the applet linked from today's date in the course schedule. Dipole results can be seen with the applet or with the Mathcad worksheet for Sect. 3.6.2

