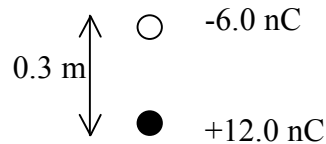


Homework 3  
Due September 25, 2009

272:

1.- Consider a system of two charges as in the figure. Let  $z$  be the coordinate along the line on which the two charges lie, with  $z=0$  at the location of the positive charge. Make a plot of the potential  $V$  along this line, from  $z=-5\text{m}$  to  $z=15\text{m}$



2.- A thin rod extends along the  $z$  axis from  $z=-a$  to  $z=a$ . The rod carries a charge uniformly distributed along its length, of  $\lambda$  C/m. Calculate the potential for all points on the  $x$  axis, for  $x>0$ .

272H (the two previous and the following ones):

3.- A hollow circular cylinder, of radius  $a$  and length  $b$ , with open ends, has a total charge  $Q$  uniformly distributed over its surface. What is the difference of potential between a point on the axis at one end and the midpoint of the axis? Show by sketching some field lines how do you think the Electric field ought to look inside and outside.

4.- The potential at the center of a disk of radius  $a$  carrying a uniform charge density  $\sigma$  is  $\sigma a/2\epsilon_0$ . Knowing this, suppose we want to estimate the potential at the center of a uniformly charged square of side  $b$ , to an accuracy of a few percent. How could you estimate it without trying to solve the potential problem for the square? Can you put limits on the possible error in your estimate.