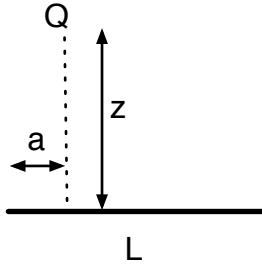


Phys 110A Homework 4; Due Thurs 9/22

1. A) Find the potential at the point Q below – do NOT use the known E-field as a starting point, but rather calculate the potential directly from the charge distribution.

(A straight line wire of length L carries a uniform charge per unit length of λ ; same problem as the one in the earlier homework, only now you're solving for V .)



1B) Explain/Show how you would use your answer in part A to find all three components of the E-field at point Q. (In Cartesian coordinates!) No need to actually do the math.

2. Find the potential difference between the surfaces of two solid spheres, each with total charge Q . One sphere has a radius " a ", the other sphere has a radius " b ". The centers of the spheres are a distance D apart. (Obviously, $D > a + b$, since the spheres don't touch.) Assume the spheres both have a uniform charge density (although each sphere will have a **different** density!).

3) Consider a cube, with a point charge on each of the 8 corners; each charge is Q . A ninth charge is brought in; this 9th charge has a charge $+2Q$. The cube edge length is " a ".

A) How much work does it take to move the 9th charge from infinity to the middle of one of the faces of the cube? (A positive answer means that this requires input work, a negative answer means work is done by the particle.)

B) How much work does it take to move the 9th charge from the middle of one of the faces to the very center of the cube? (Same sign convention.)

C) Determine whether the $2Q$ charge at the center of the cube would be stable, or whether it is energetically favorable for it to escape.

4) Problem 2.34 (it's problem 2.32 in the 3rd edition).