Problems for HW 3

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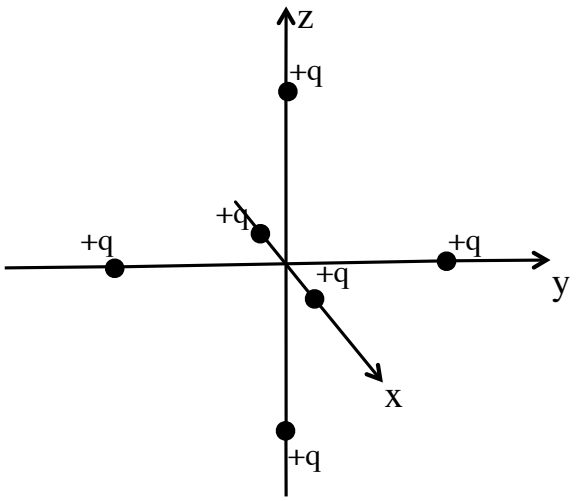
Due 20 Oct 2009, 5 pm

1 HW3 Problem 1

6 equal charges $+q$ are placed at $\pm a$ on the $x-$, $y-$ and $z-$axes.



a) Find the electrostatic energy of the configuration.

b) What is the potential at the origin?

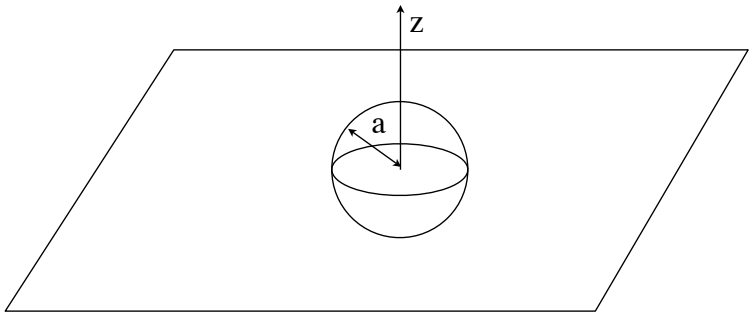
c) What charge $-Q$ would you have to place at the origin so that the total energy of the charge distribution is zero?

2 HW3 Problem 2

Sometimes the surface of water carries a charge. Here is a simple model for a charged bubble floating on the surface of the charged water.

An infinite sheet of charge has surface charge density σ. A sphere of charge, of radius a and also with surface charge density σ, lies with its equator at the plane. No charge density lies within the sphere: the sheet's surface charge ends at the surface of the sphere.

Find the potential V as a function of height above the center of the sphere, both inside and outside. Sketch $V(z)$. What boundary conditions must $V(z)$ satisfy at $z = 0$ and $z = a$?



3 Problems from Griffiths

2.32, 2.36, 2.37, 2.39, 2.46