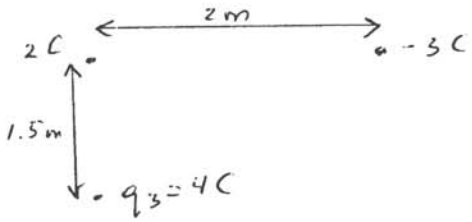
Assignment 9
Electrostatics

1. Two equally charged 1 gram masses repel each other. The lower mass is held fixed.
   a) What is the charge on each mass for the Coulomb force to balance the gravitational force of the Earth on the upper mass?

   b) How many electrons does this charge represent?

2. Consider the three charges located at the positions below.



   a) Find the electric field on charge q_3.

   b) Find the force on q_3.

   c) What happens if the charges are free to move?

3. Two metal plates have a uniform charge density of 10 Coulombs/meter^2. The plates have dimensions of 0.6 x 0.6 meter^2 and are separated by 2 mm.
   a) The electric field (volts/meter) between the two plates is given by $E = 1.13 \times 10^{11} Q / A$ where Q is the charge in Coulombs on one plate and A is the area in meters^2. Evaluate the field.

   b) What is the voltage between the two plates?

   c) What is the charge stored on one plate?

4. Consider two opposite charges. One is very heavy and may be assumed to be fixed while the other one has a mass m and orbits the second at a radius r and velocity v.
   a) Show that the relation between the orbital radius and the orbital period is given by Kepler's Law.

   b) If the radius is doubled what happens to the period?