# Practice Exam # 1 – Physics 152

February 13, 2008

Be sure to include pictures, coordinate systems, etc. where reasonable. Be explicit about what arguments you are using when determining a physical quantity, (e.g. $\vec{E}$).

1. In Figure below is shown a distribution of charges. What is q in terms of Q if the net electrostatic force on the chared particle at the upper left corner of the square array is to be zero?
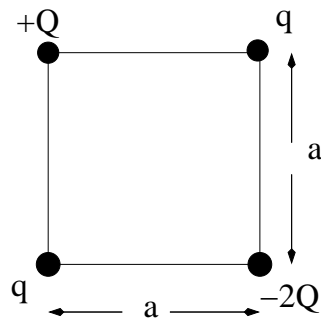
2. What is an electric field? Why is it a useful idea?

3. A thin glass rod is bent in the shape of a semicircle of radius r. A charge of $+q$ is uniformly distributed on the upper half and a charge $-q$ is uniformly distributed along the lower half of the circle. Find the magnitude and direction of the electric field at P, the center of the semicircle.
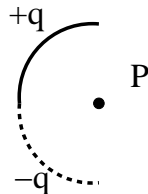
4. A long, nonconducting solid cylinder of radius $4.0cm$ has a nonuniform volume charge density ρ that is a function of the radial distance r from the axis of the cylinder, where $\rho = Ar^2$ with $A = 2.5\mu C/m^5$. What is the magnitude of the electric field at a distance of

   (a) $3.0cm$ from the axis of the cylinder?

   (b) $5.0cm$ from the axis of the cylinder?

5. In the following figure how much work is required to bring the charge of $+5q$ from infinity to the point shown along the dotted line?

$+4q$ 2d $+5q$

43° 60°

d

$-2q$

Off to infinity