Physics 227H, Fall 2018: Problems for Recitation 1

**7** In Fig. 21-22, three charged particles lie on an x axis. Particles 1 and 2 are fixed in place. Particle 3 is free to move, but the net electrostatic force on it from particles 1 and 2 happens to be zero. If $L_{23} = L_{12}$, what is the ratio $q_1/q_2$?

**13** In Fig. 21-25, particle 1 of charge $+1.0 \, \mu C$ and particle 2 of charge $-3.0 \, \mu C$ are held at separation $L = 10.0 \, \text{cm}$ on an x axis. If particle 3 of unknown charge $q_3$ is to be located such that the net electrostatic force on it from particles 1 and 2 is zero, what must be the (a) x and (b) y coordinates of particle 3?

**10** In Fig. 21-24, four particles form a square. The charges are $q_1 = q_4 = Q$ and $q_2 = q_3 = q$. (a) What is $Q/q$ if the net electrostatic force on particles 1 and 4 is zero? (b) Is there any value of $q$ that makes the net electrostatic force on each of the four particles zero? Explain.

What is the electric field at the surface of a uniformly charged spherical ball with radius R and total charge Q (hint-remember and use the shell theorem)
In Fig. 22-28a, a circular plastic rod with uniform charge $+Q$ produces an electric field of magnitude $E$ at the center of curvature (at the origin). In Figs. 22-28b, c, and d, more circular rods, each with identical uniform charges $+Q$, are added until the circle is complete. A fifth arrangement (which would be labeled e) is like that in d except the rod in the fourth quadrant has charge $-Q$. Rank the five arrangements according to the magnitude of the electric field at the center of curvature, greatest first.

![Diagrams](image-url)