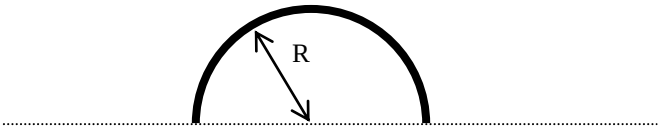
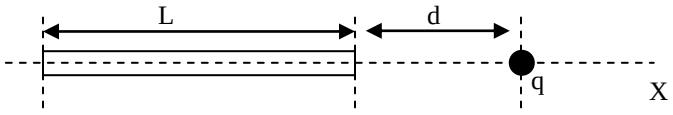
Workshop module 2 - Physics 142, Fall 2014

1. A total positive charge Q is uniformly distributed around a semicircle of radius R. Find the electric field (magnitude and direction) at the center of the semicircle (center of curvature).



2. A thin, non-conducting rod of length L carries a total charge positive Q distributed uniformly along it's length. Determine the electrostatic force of this rod of charge on a positive charge q located a distance d from one end of the rod along the central axis of the rod as shown in the sketch.



3. A flat, square surface with sides of length L is described by the equations x=L, 0<=y<=L, 0<=z<=L. (a) draw the square on a drawing of x, y, z axes (b) find the electric flux through the square due to a positive point charge q placed at the origin.

4. Some modern aircraft are made primarily of composite materials (nonconductors). The U.S. Federal Aviation Administration requires that such aircraft have conducting wires imbedded into their surfaces. Why?

5. A conducting spherical shell with inner radius A and outer radius B has a positive charge of magnitude +2Q distributed evenly in its interior. The total charge on the shell is –3Q, and it is insulated from its surroundings That is to say, we have a spherical region with radius A that has a charge of +2Q spread evenly throughout which is surrounded by a conducting shell (inner radius A and outer radius B) holding a net charge of -3Q. (a) Where does the charge reside on the conducting shell? (b) Calculate the electric fields everywhere for this system. (c) Graph the electric field as a function of the radius. (d) How would this problem change if the charge distributed in the interior had a volume charge density given by $\rho(r)=(C/r^2)$, where C is a constant?