Tutorial 1

Chater 1: Electric Force and Electric Field

Exercice 1:

Two point charges $q_A = -2.0 \cdot 10^2$ nC and $q_B = +6.0 \cdot 10^2$ nC are separeted of 10 cm each other.

1. Do these point charges attract or repel? Justify.
2. Depermine the electrostatic force exerted by q_A charge on q_B charge
3. Depermine the E-field produced by q_B charge

Exercice 2:

Consider the 3 "point" objects. The object at the origin has a net charge of +2q where q is some amount of positive charge. An object is located on the y-axis at (0; a) that has a net charge of -q, where a is some unit of distance. A third object is located on the x-axis at (2a; 0) that has a net charge of 3q.

1. Sketch the figure
2. If the three charges are fixed in the configuration shown in the figure, what is the net electrostatic force that the object at the origin feels due to the other two? Express your answer in terms of q, a and k.
3. If the object at the origin were not present, what is the electric field at the origin due to the other two charges?

Exercice 3:

Two small "point" objects are separated by a distance d. The object on the left has a net charge of 9q, and the object on the right has a net charge of -4q, where q is some positive amount of charge. At what location in the figure is the electric field equal to zero?

Exercice 4:

Suppose there are two small "point" objects located on the "y-axis". One object has a charge of +q and is located at the coordinates (0,+a). The other "point" object has a charge of -q and is located at the coordinates (0,-a). Find:

1. The electric field vector for locations on the y-axis (0,y) such that |y| > a.
2. The electric field vector for locations on the x-axis (x,0).

Exercice 5:

Show that the E-field produced by an infinitely charged plane is $E = \frac{\sigma}{2\varepsilon_0}$

Hint: Determine first the E-field produced by a ring on the axis , then the E-field produced by a disk of radius R on the axis (knowing that a ring is an infinite element of the disk) and finally deduce the E-field produced by an infinitely charged plane considering $R \gg z$