EPITA-S3
2020/2021

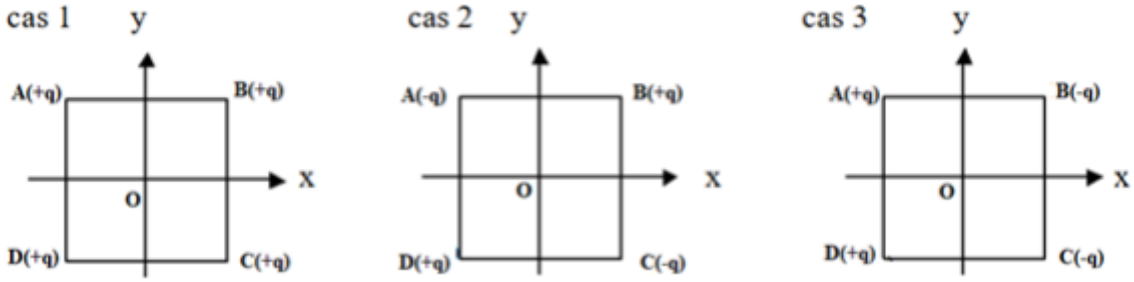
Exercise sheet n°1
Electrostatics

Exercise 1

Consider four point loads located at the four vertices of a square.

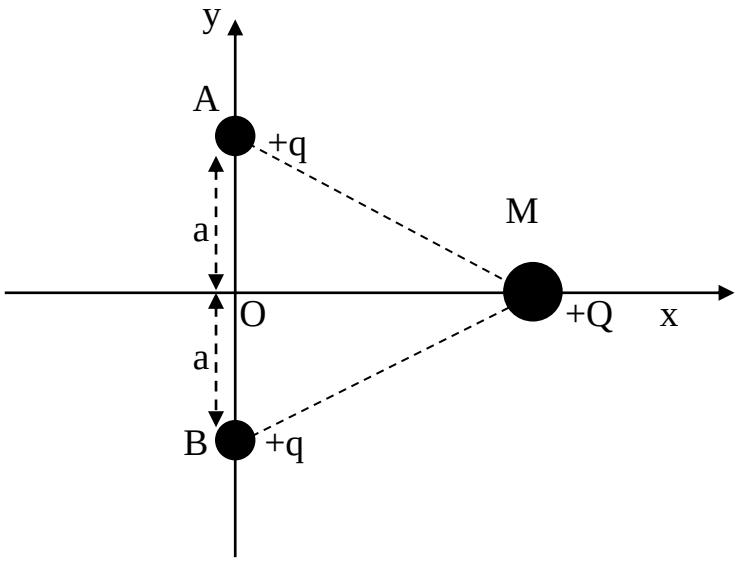
For the 3 following cases:

1- Sketch and calculate the norms of the electric field vectors created at the center of the square O by the four point loads located at the four vertices of a square.
2- Sketch the resultant electric field created on O and express its norm, in trems of k, q and a.
3- Express the resultant electrical potential V(O), in trems of k, q and a.



Exercise 2

Consider two pointlike charges, both with charge q = 2 µC. They are located at points A and B along the y-axis separated from point O by a distance a = 3 cm.
A charge +Q = 4 µC is at point M on x-axis such that OM = x.

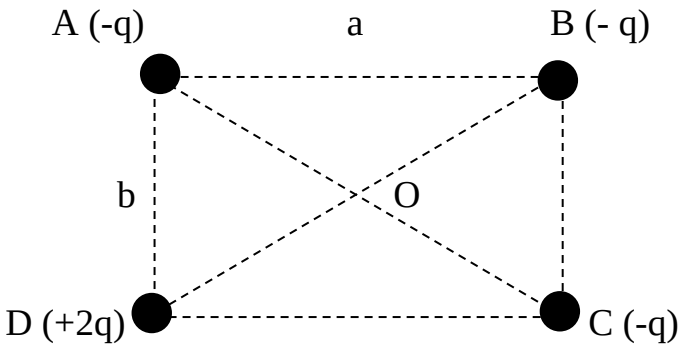


1- Sketch the net force $\vec{F}_e$ of all the electrostatic forces acting on the charge Q at point M.

2- Determine as a function of x the intensity of $\vec{F}_e$.

Exercise 3

Four point-like charges (with q > 0) are located at points A, B, C and D. These points are corners of a rectangle of length a, width b and center O such that angle (ABO) = 30°.



1- Express the norms of the electric vector fields $\vec{E}_A(B)$, $\vec{E}_D(B)$ and $\vec{E}_C(B)$ which are generated at B respectively by charges q_A, q_D et q_C. Write their expression in terms of k, q and a. Draw them.

2- Write the norm of the total electrostatic field $\vec{E}(B)$ which is created at B as function of k, q and a. Sketch $\vec{E}(B)$.

3- Write the norm of the total electrostatic field $\vec{E}(O)$ which is created at O as function of k, q and a. Sketch $\vec{E}(O)$.

4- Compute the electrostatic potential V(O) created at O in terms of k, q and a.