

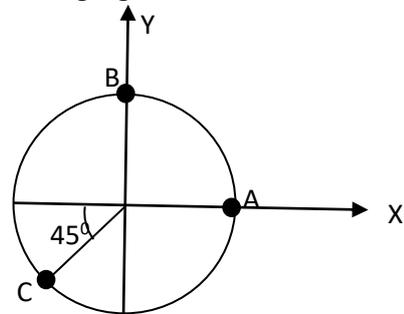


SW N° 01 of Electricity
Electrostatic
Part 1 : Point charges

Exercise 1 :

Consider three point charges placed at points A, B, and C belonging to a circle with center O and radius R. $q_A = -q$; $q_B = -2q$; $q_C = +5q$.

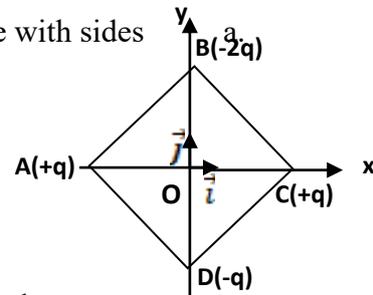
- 1) Calculate the electric field created by the three charges at point O, the center of the circle.
- 2) Deduce the electric force exerted on the charge $q_O = -q$, placed at O. (represent the forces)
- 3) Calculate the potential V_O created at point O.



Exercise 2 :

Four point charges are placed at the vertices ABCD of a square with sides

- 1- Calculate the resultant of the electrostatic forces on the charge $(-2q)$ located at B and represent this force.
- 2- Deduce the electric field at point B and represent it.
- 3- Express the potential V at point B created by the three other charges.
- 4- Determine the electrostatic field at point O (center of the square).



Exercise 3:

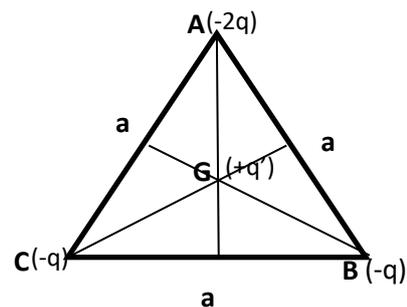
Consider three negative electric charges ($q_C = q_B = -q$ and $q_A = -2q$) located at the apex of an equilateral triangle, and a fourth positive charge $(+q')$ located at the center of gravity G of the triangle.

- 1- Calculate the resultant of the electrostatic forces exerted on the charge $(+q')$ located at G and represent this force.

2- Deduce the electrostatic field at point G.

3- Calculate the potential at point G.

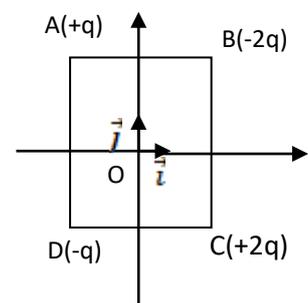
Let's say that: $AG = BG = CG = \frac{a}{\sqrt{3}}$



Exercise 4:

Four point charges are placed at the vertices ABCD of a square with side $a = 1\text{m}$, and center O, origin of an orthonormal reference frame Oxy of unit vectors.

1. Calculate the resultant of the electrostatic forces exerted on the charge $(-q)$ located at D.
2. Determine the electric field at center O of the square. Specify the direction and norm of this field.
3. Express the potential V at O created by the four charges.



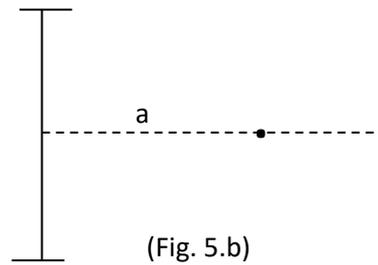
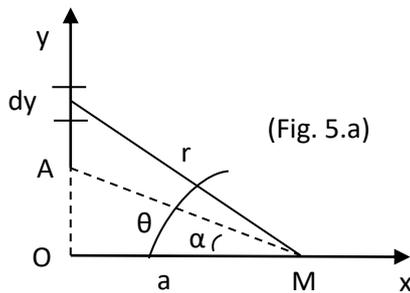


Part 2 : Continuous charges distributions

Exercise 1:

Consider a straight wire (Ay), carrying a linear density of charge, and a point M in space defined by distance $OM=a$ and angle $\alpha = (\vec{OM}, \vec{MA})$ (Fig 5.a).

1. Express the electric field components dE_x and dE_y resulting from the charge in the elementary element of length dy defined by the angle θ .
2. Deduce the E_x and E_y components of the electric field created by the wire (Ay) and its modulus.
3. Deduce the expression of the electric field at point M equidistant from the ends of the wire of length $2L$ (Fig.5.b).
4. Deduce the expression for the electric field created by an infinite rectilinear wire



Exercise 2 :

A linear charge ($\lambda > 0$) is distributed uniformly over a turn (ring) of radius R.

1. Calculate the electrostatic field produced by the coil at point M located on axis (Ox) at distance x from center O.
2. Calculate the electrostatic potential at point M.

