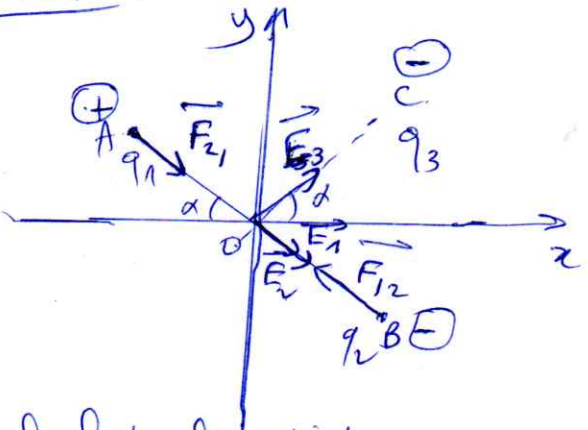
TD2 : physique 2 — 2021-2022

Exo1 :



1) calcul de la distance r

$F_{12} = F_{21} = 1N$:

$F_{12} = \dfrac{k|q_1||q_2|}{r^2} \Rightarrow r^2 = \dfrac{k|q_1||q_2|}{F_{12}}$

$r = \sqrt{\dfrac{k|q_1||q_2|}{F_{12}}} = 0{,}3\ m.$

2) Représentation et calcul de $\vec{E}_0$

$\vec{E}_0 = \vec{E}_1 + \vec{E}_2 + \vec{E}_3$

$= E_1(\cos\alpha\,\vec{i} - \sin\alpha\,\vec{j}) + E_2(\cos\alpha\,\vec{i} - \sin\alpha\,\vec{j}) + E_3(\cos\alpha\,\vec{i} + \sin\alpha\,\vec{j})$

$= [(E_1 + E_2 + E_3)\cos\alpha]\,\vec{i} + (-E_1 - E_2 + E_3)\sin\alpha\,\vec{j}$

$= \left[\dfrac{k|q_1|}{(OA)^2} + \dfrac{k|q_2|}{(OB)^2} + \dfrac{k|q_3|}{(OC)^2}\right]\cos\alpha\,\vec{i} + \left[\dfrac{-k|q_1|}{(OA)^2} - \dfrac{k|q_2|}{(OB)^2} + \dfrac{k|q_3|}{(OC)^2}\right]\sin\alpha\,\vec{j}$

on : $OA = OB = OC = \dfrac{AB}{2} = \dfrac{r}{2}$

$\vec{E}_0 = \left[\dfrac{k|q_1|}{r^2/4} + \dfrac{k|q_2|}{r^2/4} + \dfrac{k|q_3|}{(r^2/4)}\right]\cos\alpha\,\vec{i} + \left[\dfrac{-k|q_1|}{r^2/4} - \dfrac{k|q_2|}{r^2/4} + \dfrac{k|q_3|}{r^2/4}\right]\sin\alpha\,\vec{j}$

$\vec{E}_0 = \dfrac{4k}{r^2}\left[(|q_1| + |q_2| + |q_3|)\cos\alpha\,\vec{i} + (-|q_1| - |q_2| + |q_3|)\sin\alpha\,\vec{j}\right]$

$= 34{,}6 \times 10^5\,\vec{i} - 8 \times 10^5\,\vec{j}$ V/m ou N/C

$\Rightarrow \vec{E}_0 = 2 \times 10^5(10\sqrt{3}\,\vec{i} - 4\vec{j})$

$\Rightarrow E_0 = 35{,}55 \times 10^5$ V/m ou N/m

* le potentiel V_0 :

$V_0 = V_A(0) + V_B(0) + V_C(0)$

$= \dfrac{kq_A}{OA} + \dfrac{kq_B}{OB} + \dfrac{kq_C}{OC}$

$= 0\ V.$