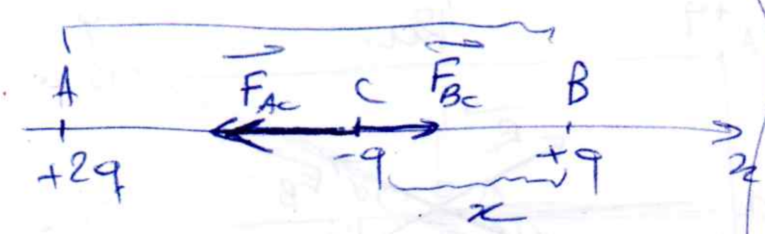
Exo 4 :



La position d'équilibre de la charge placée en C :

à l'équilibre :

$$\sum \vec{F} = \vec{0}$$

$$\vec{F}_{Bc} + \vec{F}_{Ac} = \vec{0}$$

$$\Rightarrow F_{Bc}\vec{i} - F_{Ac}\vec{i} = 0$$

$$\Rightarrow F_{Bc} = F_{Ac}.$$

$$\Rightarrow \frac{Kq^2}{x^2} = \frac{2Kq^2}{(d-x)^2}$$

$$\Rightarrow (d-x)^2 = 2x^2$$

$$\Rightarrow -x^2 + d^2 - 2dx = 2x^2$$

$$\Rightarrow x^2 + 2dx - d^2 = 0$$

$$\Rightarrow x^2 + 2\times 0{,}2\times x - (0{,}2)^2 = 0$$

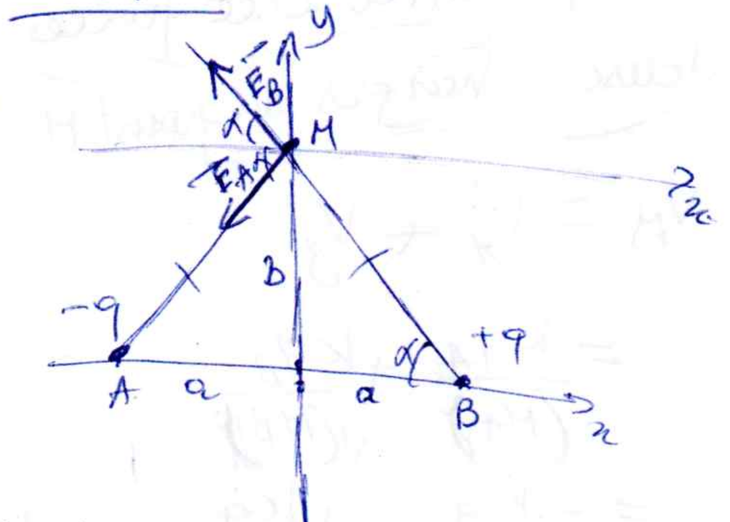
$$\Rightarrow x^2 + 0{,}4x - 0{,}04 = 0$$

$$\boxed{x_1 = 0{,}08}$$

$$x_2 = -0{,}48 < 0$$

donc : $\boxed{x_1 = 0{,}08\,m}$

Exo 5



Le champ électrostatique au point M

$$\vec{E}_M = \vec{E}_A + \vec{E}_B$$

$$\vec{E}_A = E_A(-\cos\alpha\,\vec{i} - \sin\alpha\,\vec{j})$$

$$\vec{E}_B = E_B(-\cos\alpha\,\vec{i} + \sin\alpha\,\vec{j})$$

$$E_A = \frac{kq}{(MB)^2}, \quad E_B = \frac{Kq}{(MA)^2}.$$

$$MA = MB = \sqrt{a^2+b^2}$$

$$\Rightarrow E_A = \frac{kq}{(a^2+b^2)}, \quad E_B = \frac{Kq}{(a^2+b^2)}$$

$$\vec{E}_M = \cos\alpha(-E_A - E_B)\vec{i} + \sin\alpha\underbrace{(-E_A + E_B)}_{0}\vec{j}$$

on a : $E_A = E_B$

Donc :

$$\vec{E}_M = -2E_A\cos\alpha\,\vec{i}$$

$$= -\frac{2Kq}{(a^2+b^2)}\cos\alpha\,\vec{i}$$

$$\cos\alpha = \frac{a}{\sqrt{a^2+b^2}}.$$

$$\Rightarrow \vec{E}_M = -\frac{2kqa}{(a^2+b^2)^{\frac{3}{2}}}\,\vec{i} \quad V/m,\ N/C$$