ELECTRICITATE

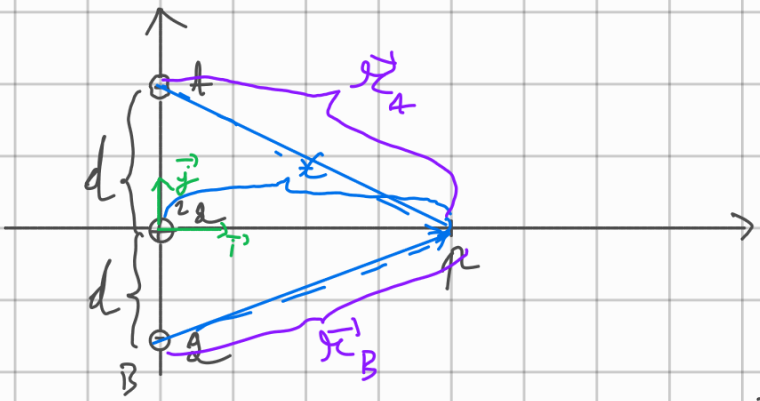
Câmp electric, câmp electrostatic

$$\vec{E} = k \cdot \frac{q}{|\vec{r}|^3} \cdot \vec{r}$$

$$\vec{F} = k \cdot \frac{Q_1 Q_2}{|\vec{r}|^3} \vec{r} \Rightarrow \vec{F} = q \cdot \vec{E}$$

$$\Rightarrow [\vec{E}]_{SI} = \frac{N}{C}$$

$$\vec{E}_q = \vec{E}_{q_1} + \vec{E}_{q_2}$$



$\vec{E}_r = ?$

$\vec{r}_B = d\vec{j} + x\vec{i}$

$\vec{r}_A = -d\vec{j} + x\vec{i}$

$\vec{x} = x\vec{i}$

$$\vec{E}_r = \vec{E}_{Br} + \vec{E}_{Or} + \vec{E}_{Ar}$$

$$\vec{E}_{Br} = k \cdot \frac{-q}{r_B^3} \cdot \vec{r}_B$$

$$\vec{E}_{Or} = k \cdot \frac{2q}{x^3} \cdot \vec{x}$$

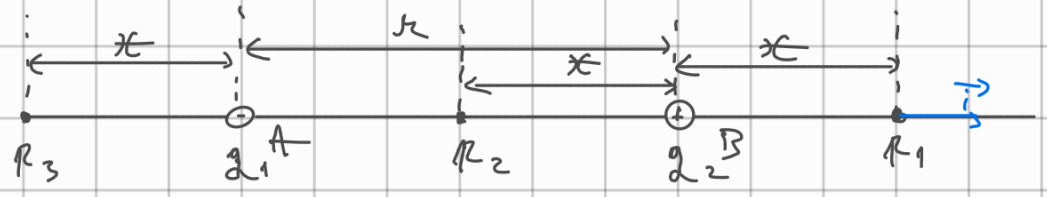
$$\vec{E}_{Ar} = k \cdot \frac{-q}{r_A^3} \cdot \vec{r}_A$$

$$\Rightarrow \vec{E}_r = k \cdot q \left(\frac{-1}{r_B^3} \cdot \vec{r}_B + \frac{2}{x^3} \cdot \vec{x} - \frac{1}{r_A^3} \cdot \vec{r}_A \right)$$

$$= k \cdot q \left(\frac{-1}{\sqrt{(x^2+d^2)^3}} \cdot (x\vec{i} + d\vec{j}) + \frac{2}{x^3}(x\vec{i}) - \frac{1}{\sqrt{(d^2+x^2)^3}}(-d\vec{i} + x\vec{j}) \right)$$

$$= \left| k \cdot q \left(\frac{-2x\vec{i}}{\sqrt{(x^2+d^2)^3}} + \frac{2}{x^3} |x\vec{i}| \right) \right|$$

2)



$E_{R_1} = ?$
$E_{R_2} = ?$
$E_{R_3} = ?$

$\vec{E}_{R1} = \vec{E}_A + \vec{E}_B$

$\vec{E}_A = k \cdot \frac{q_1}{(r+x)^3} \cdot (\vec{r} + \vec{x})$

$\vec{E}_B = k \cdot \frac{q_2}{x^3} \cdot \vec{x}$

$q_1 = -q$
$q_2 = 2q$

$$\Rightarrow \vec{E}_{R1} = kq\left(\frac{-1}{(r+x)^3}(\vec{r} + \vec{x}) + \frac{2}{x^3} \cdot \vec{x}\right)$$

$\vec{x} = x\vec{i}$

$\vec{r} + \vec{x} = (r+x)\vec{i}$

$$\vec{E}_{R1} = kq\left(-\frac{1}{(r+x)^2}\cancel{(r+x)}\vec{i} + \frac{2}{x^3}\cancel{x}\vec{i}\right)$$

$$\vec{E}_{R1} = kq\left(\frac{-1}{(r+x)^2}\vec{i} + \frac{2}{x^2}\vec{i}\right)$$

$$\vec{E}_{R1} = kq\left(\frac{-1}{(r+x)^2} + \frac{2}{x^2}\right)\vec{i}$$

$\vec{E}_{R2} = \vec{E}_B + \vec{E}_A$

$\vec{E}_B = k \cdot \frac{q_2}{|x|^3} \cdot \vec{x}$

$\vec{E}_A = k \cdot \frac{q_1}{(r-x)^3} \cdot (\vec{r} - \vec{x})$

$\vec{x} = -x\vec{i}$

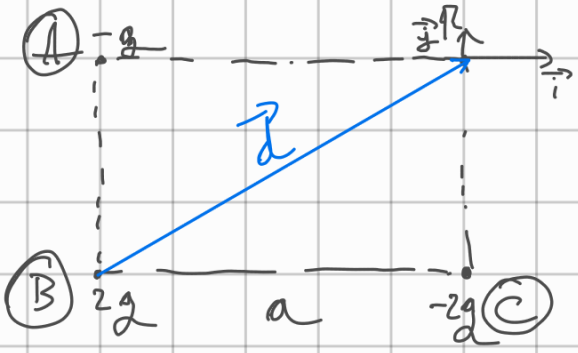
$\vec{r} = r\vec{i}$

$\vec{r} - \vec{x} = \vec{i}(r-x)$

$$\Rightarrow \vec{E}_{R2} = k\left(\frac{q_1}{x^2} \cdot (-1)x\vec{i} + \frac{q_2}{(r-x)^2}(r-x)\vec{i}\right)$$

$$= k\left(-\frac{q_1}{x^2}\vec{i} + \frac{q_2}{(r-x)^2}\vec{i}\right)$$

3)



$\vec{E}_R = ?$

$\vec{E}_R = \vec{E}_A + \vec{E}_B + \vec{E}_C$

$\vec{E}_A = k \cdot \frac{-q}{a^3} \cdot \vec{a}$

$\vec{E}_B = k \cdot \frac{2q}{d^3} \cdot \vec{d}$

$\vec{E}_C = k \cdot \frac{-2q}{a^3} \cdot \vec{a'}$

$\vec{a} = a\vec{i}$

$\vec{d} = a\vec{i} + a\vec{j}$

$\vec{a'} = a\vec{j}$

$$\Rightarrow \vec{E}_R = k \cdot q \left(\frac{-1}{a^3} \cdot a\vec{i} + \frac{2}{(a\sqrt{2})^3} (a\vec{i} + a\vec{j}) - \frac{2}{a^3} \cdot a\vec{j} \right)$$

$$\vec{E}_R = k \cdot q \left(\frac{-1}{a^2} \cdot \vec{i} + \frac{1}{a^2\sqrt{2}} \cdot (\vec{i} + \vec{j}) - \frac{2}{a^2} \cdot \vec{j} \right)$$

$$\vec{E}_R = \frac{k \cdot q}{a^2} \left(-\vec{i} + \frac{1}{\sqrt{2}} (\vec{i} + \vec{j}) - 2\vec{j} \right)$$

$$\vec{E}_R = \frac{k \cdot q}{a^2} \left(\left(-1 + \frac{1}{\sqrt{2}} \right) \vec{i} + \left(\frac{1}{\sqrt{2}} - 2 \right) \vec{j} \right)$$

$$\Rightarrow E_R = \frac{k \cdot q}{a^2} \sqrt{\left(-1 + \frac{1}{\sqrt{2}} \right)^2 + \left(\frac{1}{\sqrt{2}} - 2 \right)^2}$$