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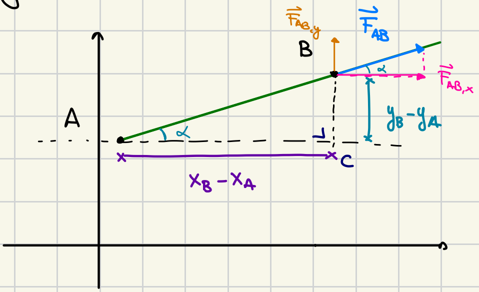

$q_A = 3{,}7 \cdot 10^{-9}\ C$

$q_B = 6{,}2 \cdot 10^{-9}\ C$

$A = (1, 5)$ cm

$B = (11, 8)$ cm

$$F_{AB} = k_0 \frac{|q_A||q_B|}{AB^2} \qquad AB^2 = (x_B - x_A)^2 + (y_B - y_A)^2$$

Per trovare α prendo il triangolo $\hat{ABC}$: $tg(\alpha) = \dfrac{\text{cateto opposto}}{\text{cateto adiacente}}$

$$\rightsquigarrow \boxed{tg(\alpha) = \frac{y_B - y_A}{x_B - x_A} \quad \rightsquigarrow \quad \alpha = tg^{-1}\left(\frac{y_B - y_A}{x_B - x_A}\right)}$$

$F_{AB,x} = F_{AB} \cdot \cos\alpha \approx 18{,}1\ \mu N$

$F_{AB,y} = F_{AB} \cdot \sin\alpha \approx 5{,}51\ \mu N$

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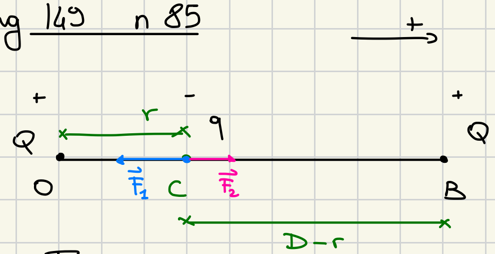
$x=\frac{r}{D}$



OB = D

Q in A e B Q positive

r > 0

q in C negative

▷ F_{TOT} su q

$$F_1 = k_0 \frac{|Q||q|}{r^2} \qquad F_2 = k_0 \frac{|Q||q|}{(D-r)^2}$$

$$\vec{F}_{TOT} = \vec{F}_1 + \vec{F}_2 \quad \leadsto$$

$$F_{TOT} = F_2 - F_1 = \frac{k_0|Q||q|}{(D-r)^2} - \frac{k_0|Q||q|}{r^2} =$$

$$= k_0|Q||q|\left(\frac{1}{(D-r)^2} - \frac{1}{r^2}\right) =$$

$$= -k_0 Q q\left(\frac{\cancel{r^2} - D^2 - \cancel{r^2} + 2Dr}{r^2(D-r)^2}\right) =$$

$$= \frac{-k_0 Q q D}{r^2(D-r)^2}(2r-D)$$

▷ Definisci $\underbrace{x=\frac{r}{D}}_{= r = Dx}$ e trova l'espressione di $f(x) = \frac{D^2 F_{TOT}}{k_0 Q|q|}$ $0<x<1$

$$f(x) = \frac{\cancel{D^2}}{\cancel{k_0}\cancel{Q}\underbrace{|q|}_{=-\cancel{q}}} \cdot \left(\cancel{-}\frac{\cancel{k_0}\cancel{Q}\cancel{q}D}{\cancel{D^2}x^2(D-Dx)^2}\cdot(2Dx-D)\right)$$

$$= \frac{\cancel{D^2}(2x-1)}{x^2\cancel{D^2}(1-x)^2} = \frac{2x-1}{x^2(1-x^2)}$$

$f(x)=0$ se $x=\frac{1}{2}$

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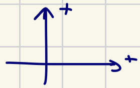

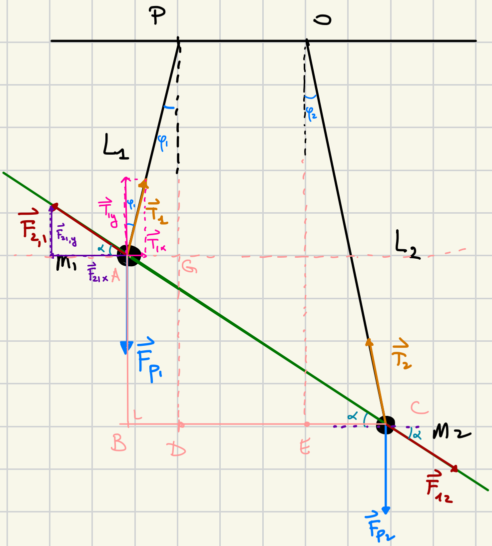

$OP = d = 4\,cm$

$L_1 = 12\,cm$

$q_1 = 0{,}9 \cdot 10^{-7}\,C$

$q_2 = 3{,}8 \cdot 10^{-8}\,C$

$\varphi_1 = 2°C$

$\varphi_2 = 5°C$

Tutto in equilibrio

$m_1 = ?$ $m_2 = ?$

$T_1 = ?$ $T_2 = ?$

Scrivo il II principio per entrambe le masse

corpo 1: $\vec{F}_{21} + \vec{F}_{p_1} + \vec{T}_1 = 0$

$T_{1x} = T_1 \sin\varphi_1$ $\quad F_{21x} = F_{21} \cos\alpha$

$T_{1y} = T_1 \cos\varphi_1$ $\quad F_{21y} = F_{21} \sin\alpha$

$BC = BD + DE + EC$

$BC = L_1 \sin\varphi_1 + d + L_2 \sin\varphi_2 \approx$

$AB = OE - PG$

$AB = L_2 \cos\varphi_2 - L_1 \cos\varphi_1 \approx$

$\alpha = tg^{-1}\left(\frac{AB}{BC}\right) \approx$

$AC = \frac{AB}{\sin\alpha} \approx$

$F_{21} = F_{12} = k_0 \frac{q_1 q_2}{AC^2} \approx$

$\boxed{\text{Corpo 1}}$, Asse x: $-F_{21}\cos\alpha + T_1 \sin\varphi_1 = 0$

Asse y: $F_{21}\sin\alpha - \overset{m_1 g}{F_{p_1}} + T_1 \cos\varphi_1 = 0$

$$\rightsquigarrow \; T_1 = \frac{F_{21}\cos\alpha}{\sin\varphi_1} \approx$$

$$m_1 = \frac{F_{21}\sin\alpha + T_1\cos\varphi_1}{g} \approx$$

$\rightsquigarrow$ Per il corpo 2, agire nello stesso modo.

□

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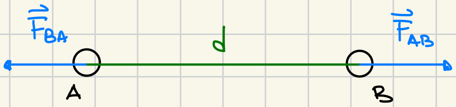
1:

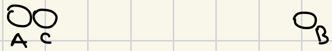


$q_A = q_B = q$
Si respingono con forza F

terza sfera identica, conduttrice

$$F = k_0 \frac{q^2}{d^2}$$

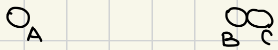
2:



La carica si ridistribuisce su A e C.
la carica totale è q e si divide a metà tra q_A e q_C

$$q_A = \frac{q}{2} \qquad q_C = \frac{q}{2} \qquad q_B = q$$

3:

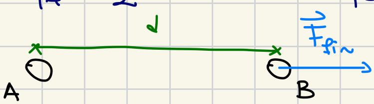


La carica totale tra B e C si ridistribuisce: $q_B + q_C = q + \frac{q}{2} = \frac{3}{2}q$

La carica totale è $\frac{3}{2}q$ e si divide a metà tra q_B e q_C

$$q_A = \frac{q}{2} \qquad q_C = \frac{3}{4}q \qquad q_B = \frac{3}{4}q$$

4:



$$q_A = \frac{q}{2} \qquad q_B = \frac{3}{4}q$$

$$F_{fin} = k_0 \frac{|q_A||q_B|}{d^2} = k_0 \frac{q^2 \cdot \frac{1}{2} \cdot \frac{3}{4}}{d^2} = \frac{3}{8} k_0 \frac{q^2}{d^2} = \frac{3}{8} F$$

□

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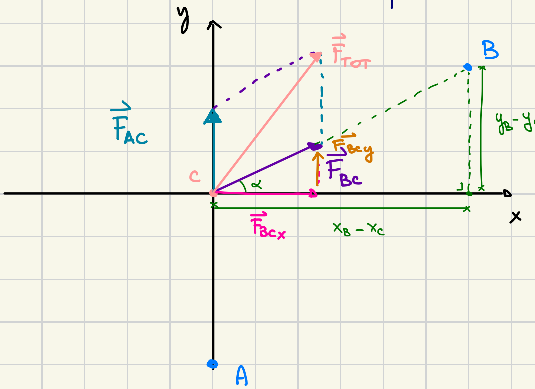


$q_A = 1{,}6\,nC = 1{,}6 \cdot 10^{-9}\,C$
$q_B = -3{,}3\,nC = -3{,}3 \cdot 10^{-9}\,C$

$A = (0, -4)$ cm
$B = (6, 3)$ cm

$q_c = 3{,}0\,nC = 3 \cdot 10^{-9}\,C$
$O = C = (0,0)$ cm
modulo $\vec F_{TOT}$ su q_c

$$F_{AC} = k_0 \frac{|q_A||q_c|}{AC^2}$$

Distanze tra due punti
$$AC^2 = (x_A - x_c)^2 + (y_A - y_c)^2$$
$$AC^2 = (y_A)^2$$

$$\alpha = tg^{-1}\left(\frac{y_B - y_c}{x_B - x_c}\right)$$

$$CB^2 = (x_B - x_c)^2 + (y_B - y_c)^2$$
$$CB^2 = x_B^2 + y_B^2$$

$$F_{BC} = k_0 \frac{|q_B||q_c|}{BC^2}$$

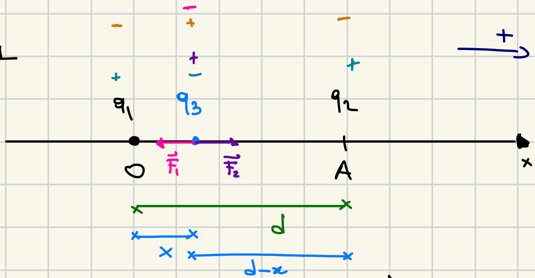
$$F_{BC,x} = F_{BC} \cdot \cos\alpha \qquad F_{BCy} = F_{BC} \cdot \sin\alpha$$

Su Asse x: $\quad F_{TOT,x} = F_{BCx}$

Su Asse y: $\quad F_{TOT,y} = F_{AC} + F_{BCy}$

$$\vec F_{TOT} = (F_{BCx}\ ,\ F_{AC} + F_{BCy})$$

$F_{TOT}^2 = F_{TOT,x}^2 + F_{TOT,y}^2$ $\rightsquigarrow$ e ho trovato il quadrato del modulo n4



q_1 in O

q_2 in A

$OA = d > 0$

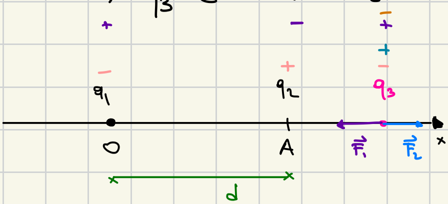
q_3 in P da qualche parte

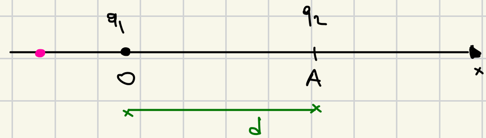
▷ Quali sono i segni di q_1 e q_2 se su q_3 c'è forza tot. nulla e

a) q_3 è nel segmento OA ⇝ Segni di q_1 e q_2 uguali

b) q_3 è a destra di A ⇝ Segni di q_1 e q_2 opposti

c) q_3 è a sinistra di O ⇝ Uguale a B.





▷ Calcolare la forza su q_3 nei 3 casi:

a) $\vec{F}_{TOT} = \vec{F}_1 + \vec{F}_2$ $\quad F_1 = k_0 \dfrac{|q_1||q_3|}{x^2}$ $\quad F_2 = k_0 \dfrac{|q_2||q_3|}{(d-x)^2}$