Lecture 4 (12-1)

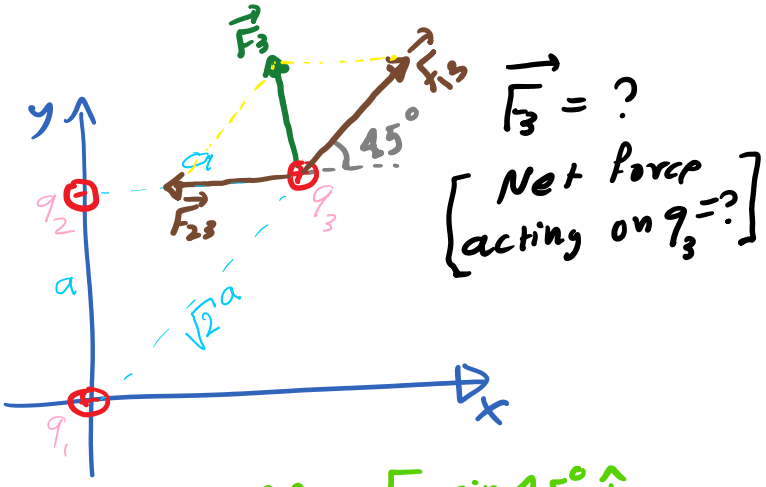
Tuesday, March 2, 2021 10:57 AM

Ex 23.2

$a = 0.1\ m$

$q_1 = q_3 = 5\ \mu C$

$q_2 = -2\ \mu C$



$\vec{F}_3 = ?$

[Net Force acting on q_3 =?]

$$\vec{F}_3 = \vec{F}_{13} + \vec{F}_{23}$$

$$\vec{F}_{13} = F_{13x}\hat{i} + F_{13y}\hat{j} = F_{13}\cos 45^\circ \hat{i} + F_{13}\sin 45^\circ \hat{j}$$

$$\vec{F}_{23} = F_{23x}\hat{i} + F_{23y}\hat{j} = F_{23}\cos 180^\circ \hat{i} + F_{23}\sin 180^\circ \hat{j}$$

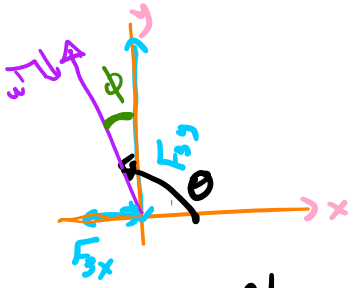
$$|\vec{F}_{13}| = F_{13} = k_e \frac{|q_1||q_3|}{(\sqrt{2}a)^2} = \cdots \Rightarrow F_{13} = 11.2\ N$$

$$|\vec{F}_{23}| = F_{23} = k_e \frac{|q_2||q_3|}{a^2} = \cdots \Rightarrow F_{23} = 8.99\ N$$

$$\vec{F}_{13} = (7.94\hat{i} + 7.94\hat{j})\ N$$

$$\vec{F}_{23} = -8.99\hat{i}\ N$$

$$\Rightarrow \vec{F}_3 = \vec{F}_{13} + \vec{F}_{23} \Rightarrow \boxed{\vec{F}_3 = (-1.04\hat{i} + 7.94\hat{j})\ N}$$



$$\tan\phi = \frac{1.04}{7.94} \Rightarrow \phi = 7.4^\circ$$

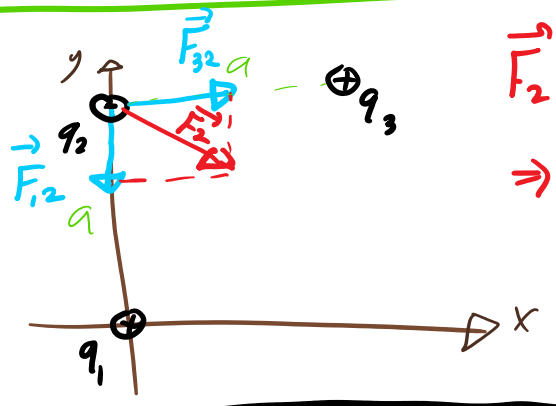
$$\theta = 90^\circ + \phi = 90^\circ + 7.4 \Rightarrow \theta = 97.4^\circ$$

$$\text{Also} \Rightarrow |\vec{F}_3| = F_3 = \sqrt{(1.04)^2 + (7.94)^2}$$

$$\Rightarrow \boxed{F_3 = 8\ N}$$

Now we want to find $\vec{F}_3$?!

What IF you want to find $\vec{F}_2$?!



$$\vec{F}_2 = \vec{F}_{12} + \vec{F}_{32}$$

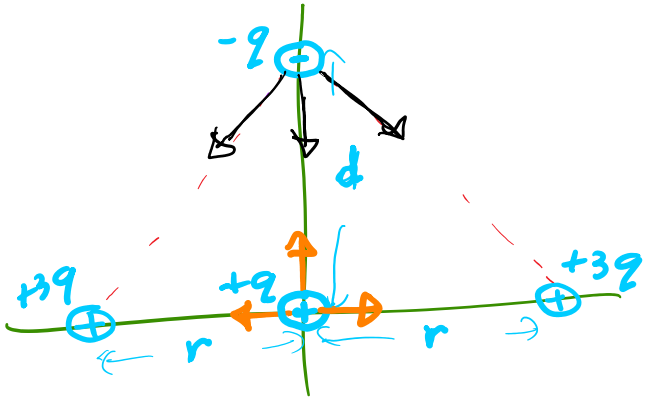
$$\Rightarrow |\vec{F}_2| = F_2 = \sqrt{F_{12}^2 + F_{32}^2}$$

Again: Note that $|\vec{F}_{23}| = |\vec{F}_{32}|$ BUT $\vec{F}_{23} = -\vec{F}_{32}$

Question: In the figure shown, determine the direction of the net force acting on:

✓A) the negative point charge.

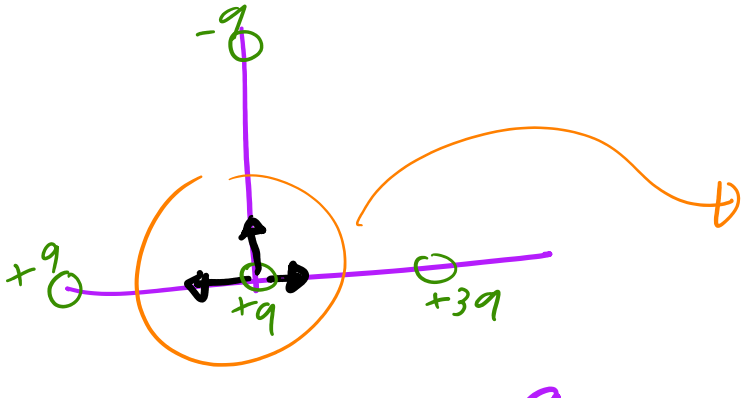
B) the positive point charge located at the origin.

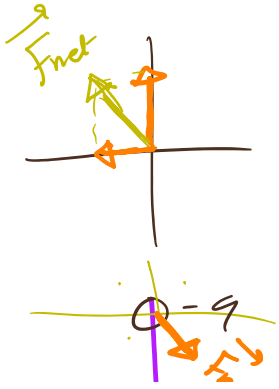


A) Downward (-y-direction)

B) Upward (+y-direction)

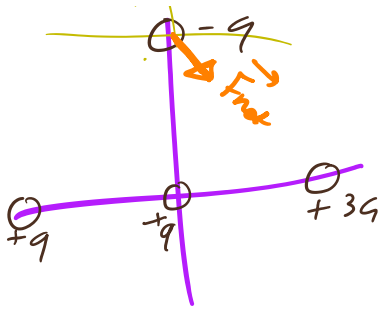
What IF? (regarding force acting on +q at the origin)





+q

Regarding -q ⇒



b