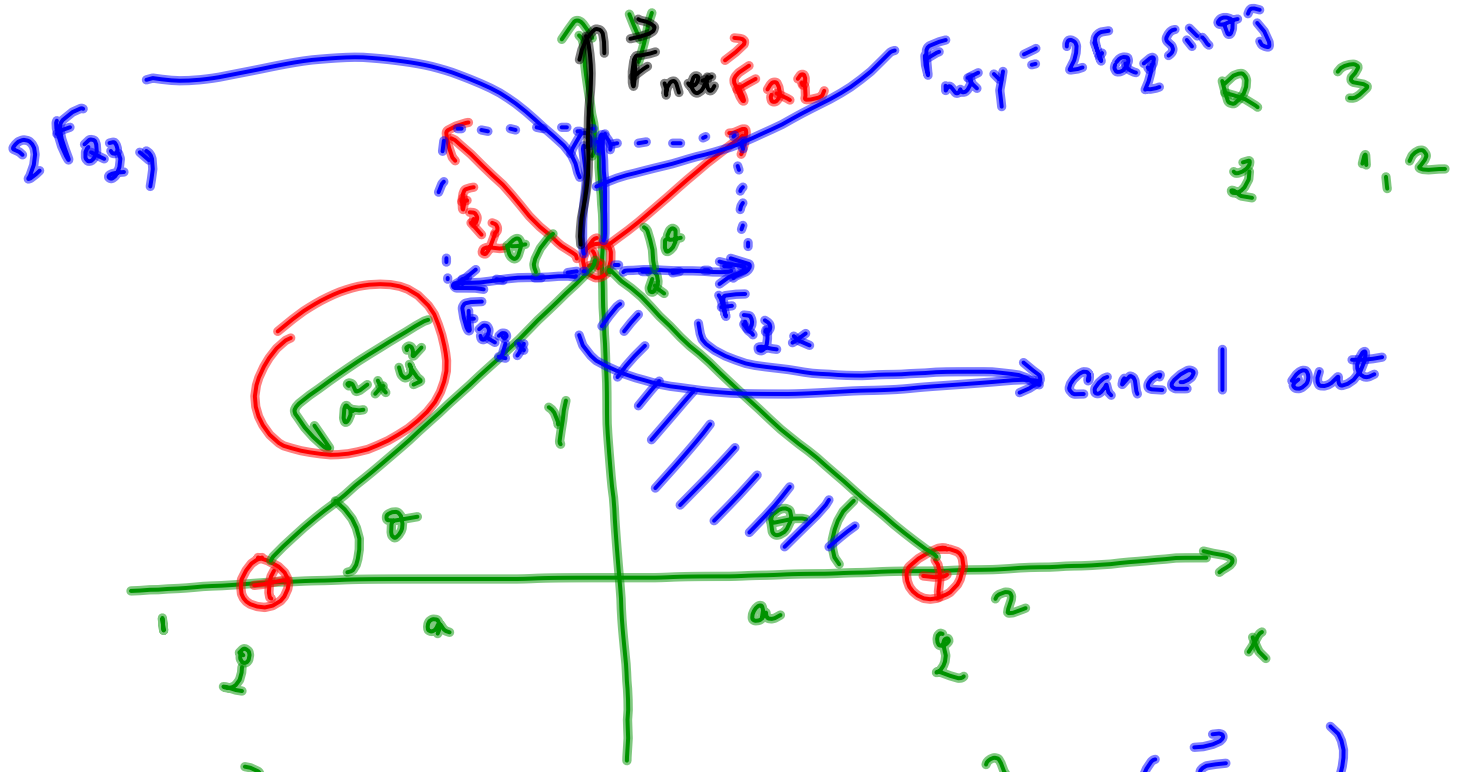
Charged raindrops are ultimetly responsible for thunderstorms. Suppose 2 drops with equal charge Q are on the x axis at $x = \pm a$.

Find the electric force on a third drop with charge Q at any arbitrary point on y axis.

Suppose that all charges are positve.



$$\vec{F}_{31} = F_{31}\cos\theta\,\hat{i} + F_{31}\sin\theta\,\hat{j} \qquad (\vec{F}_{Qq_1})$$

$$\vec{F}_{32} = -F_{32}\cos\theta\,\hat{i} + F_{32}\sin\theta\,\hat{j} \qquad (\vec{F}_{Qq_2})$$

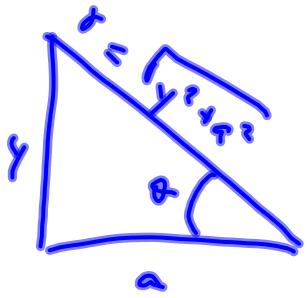
$$\vec{F}_{net} = \vec{F}_{q_1} + \vec{F}_{2_2}$$

x components canceled out

$$\vec{F}_{net} = 2F_{aq}\sin\theta \cdot \hat{j}$$

Y component add up

$$= 2 \cdot k\frac{Qq}{a^2+y^2} \cdot \sin\theta \cdot \hat{j}$$



$$= 2 \cdot k\frac{Qq}{a^2+y^2} \cdot \frac{y}{\sqrt{a^2+y^2}}\hat{j} = \frac{2kQqy}{(a^2+y^2)^{3/2}}\hat{j}$$

The electric field $\vec{E}$ [N/c]

Field model:

1) Some charges which we will call the source charges, alter the space around them by creating an electic field $\vec{E}$

2) A separate charge in the electic field experiences a force $\vec{F}$ exerted by the field (test charge)

The electric field at any point is the force per unit charge that would be experienced by a charge at that point:

$$\vec{E} = \frac{\vec{F}}{q} \quad [N/C]$$

parallel to gravitational field

or $\boxed{\vec{F} = q\vec{E}}$

q positive $\vec{F}$ & $\vec{E}$ are in the same direction

q negative $\vec{F}$ & $\vec{E}$ are in the opposite direction