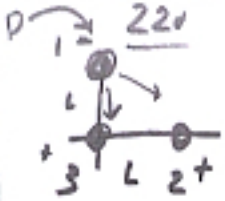


$L = .15 \quad p: 1$

$$\vec{F}_p = k q_p \sum_{\substack{i=1 \\ i \neq p}}^{n} \frac{q_i}{r_{ip}^2} \hat{r}_{ip}$$

$$\vec{r}_p = \vec{r}_1 \quad \vec{r}_2 \quad \vec{r}_3$$

$$\vec{r}_{2p} \quad \vec{r}_{3p}$$

$$\vec{r}_1 = 0\hat{x} + L\hat{y} \;/\; \vec{r}_2 = L\hat{x} + 0\hat{y}$$

$$\vec{r}_3 = 0\hat{x} + 0\hat{y}$$

$$\vec{F}_p = k q_p \sum_{\substack{i=1 \\ i \neq p}} \frac{q_i}{r_{ip}^2} \hat{r}_{ip}$$

$$\vec{r}_p = \vec{r}_1 \quad \vec{r}_2 \quad \vec{r}_3$$

$$\vec{r}_{2p} \quad \vec{r}_{3p}$$

$$\vec{r}_1 = 0\hat{x} + 1\hat{y} \;/\; \vec{r}_2 = 1\hat{x} + 0\hat{y}$$

$$\vec{r}_3 = 0\hat{x} + 0\hat{y}$$

$$\vec{r}_{2p} = \vec{r}_p - \vec{r}_2$$

$$= (0\hat{x} + 1\hat{y}) - (1\hat{x} + 0\hat{y})$$

$$\vec{r}_{2p} = -1\hat{x} + 1\hat{y}$$

$$\vec{r}_{3p} = \vec{r}_p - \vec{r}_3$$

$$= (0\hat{x} + 1\hat{y}) - (0\hat{x} + 0\hat{y})$$

$$= 0\hat{x} + 1\hat{y}$$

$$\vec{r}_{3p} = \vec{r}_p - \vec{r}_3$$

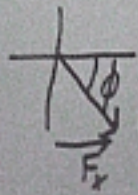
$$= (0\hat{x} + L\hat{y}) - (0\hat{x} + 0\hat{y})$$

$$= 0\hat{x} + L\hat{y}$$

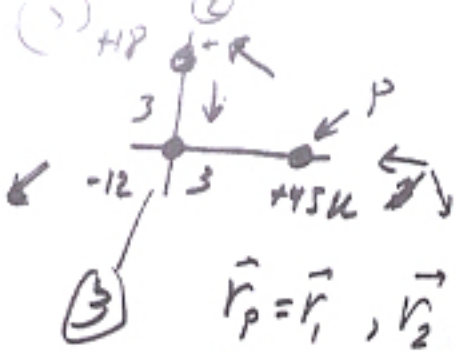
$$\vec{F}_p = k q_p \left[q_2 \frac{\vec{r}_{2p}}{(R_{2p})^3} + q_3 \frac{\vec{r}_{3p}}{|R_{3p}|^3} \right]$$

$$= k(-9\mu)\left[(+8\mu) \cdot \frac{-.15\hat{x} + .15\hat{y}}{(.15^2 + .15^2)^{3/2}} + \right.$$

$$\left. + (+3\mu) \frac{0\hat{x} + .15\hat{y}}{(0^2 + .15^2)^{3/2}} \right]$$



$$\tan\phi = \frac{F_y}{F_x}$$



$\vec{r}_p = \vec{r}_1 , \vec{r}_2 , \vec{r}_3$

$\vec{r}_{2p} , \vec{r}_{3p}$

$\vec{r}_p = \vec{r}_1 = 3\hat{x} + 0\hat{y}$

$\vec{r}_2 = 0\hat{x} + 3\hat{y}$

$\vec{r}_3 = 0\hat{x} + 0\hat{y}$

$\vec{r}_{2p} = \vec{r}_p - \vec{r}_2 = (3\hat{x} + 0\hat{y}) - (0\hat{x} + 3\hat{y})$

$= 3\hat{x} - 3\hat{y}$

$\vec{r}_{3p} = \vec{r}_p - \vec{r}_3 = (3\hat{x} + 0\hat{y}) - (0\hat{x} + 0\hat{y})$

$\vec{r}_{3p} = 3\hat{x} + 0\hat{y}$

$$\vec{r}_{2p} = \vec{r}_p - \vec{r}_2 = (3\hat{x} + 0\hat{y}) - (0\hat{x} + 3\hat{y})$$

$$= 3\hat{x} - 3\hat{y}$$

$$\vec{r}_{3p} = \vec{r}_p - \vec{r}_3 = (3\hat{x} + 0\hat{y}) - (0\hat{x} + 0\hat{y})$$

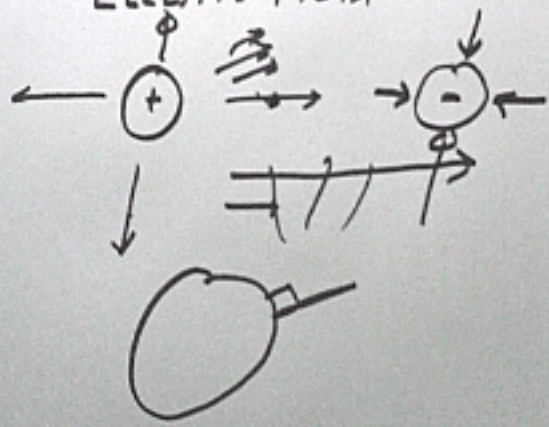
$$\vec{r}_{3p} = 3\hat{x} + 0\hat{y}$$

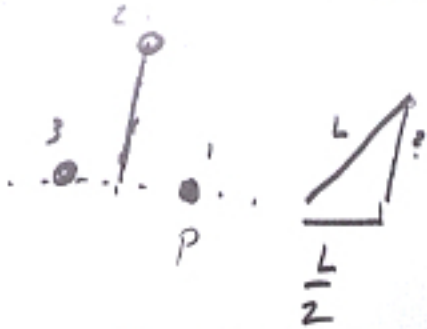
$$\vec{F}_p = k(+4.5\,M)\left[(+18\,M)\left(\frac{3\hat{x} - 3\hat{y}}{(3^2+3^2)^{3/2}}\right) + (-12\,M)\left(\frac{3\hat{x} + 0\hat{y}}{(3^2+0^2)^{3/2}}\right)\right]$$

220
ws 2

$$\vec{E}_p \equiv \frac{\vec{F}_p}{q}$$

Electric Field





$$L^2 = \left(\frac{L}{2}\right)^2 + y^2$$

$$y^2 = L^2 - \left(\frac{L}{2}\right)^2$$

$$= 4\left(\frac{L}{2}\right)^2 - \left(\frac{L}{2}\right)^2 = 3\left(\frac{L}{2}\right)^2$$

$$y = \sqrt{3}\,\frac{L}{2}$$

$= 4\left(\frac{L}{2}\right)^2 - \left(\frac{L}{2}\right)^2 = 3\left(\frac{L}{2}\right)^2$

$y = \sqrt{3}\frac{L}{2}$

$r_p = r_1 = \frac{L}{2}\hat{x} + 0\hat{y}$

$r_2 = 0\hat{x} + \frac{\sqrt{3}}{2}L\hat{y}$

$r_3 = -\frac{L}{2}\hat{x} + 0\hat{y}$

$r_{2p} = r_p - r_2 = \frac{L}{2}\hat{x} - \frac{\sqrt{3}}{2}\hat{y}$

$r_{3p} = r_p - r_3 = \left(\frac{L}{2} - -\frac{L}{2}\right)\hat{x} + (0-0)\hat{y}$

$= L\hat{x}$

$\vec{F}_1 = kq_p\left[q_2 \frac{\left(\frac{L}{2}\hat{x} - \frac{\sqrt{3}}{2}\hat{y}\right)}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} + q_3 \frac{(L\hat{x})}{(L^2+0^2)^{3/2}}\right]$

$$\vec{r}_{3P} = \vec{r}_P - \vec{r}_3 = \left(\frac{L}{2} - \frac{L}{2}\right)\hat{x} + (0-0)\hat{y}$$

$$= L\hat{x}$$

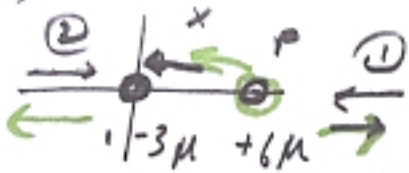
$$= k q_P \left[q_2 \frac{\left(\frac{L}{2}\hat{x} - \frac{\sqrt{3}}{2}\hat{y}\right)}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} + q_3 \frac{(L\hat{x})}{(L^2+0^2)^{3/2}} \right]$$

$$\vec{E}_P = \frac{\vec{F}}{q_P}$$

$$= k q \left[\frac{\frac{L}{2}\hat{x} - \frac{\sqrt{3}}{2}\hat{y}}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} + \frac{L\hat{x}}{(L^3)} \right]$$

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

(2)



$\vec{r}_p = 1\hat{x}$

$r_2 = 0\hat{x}$

$r_{2p} = r_p - r_2 = (1\hat{x}) - (0\hat{x})$

$= 1\hat{x}$

$\vec{F} = kq_p\left(q_2 \frac{\vec{r}_{2p}}{(r_{2p})^{3/2}}\right)$