

$$L = .15 \quad p:1$$

$$\vec{F}_p = K g_p \sum_{\substack{i=1 \\ i \neq p}}^n \frac{g_i}{r_{ip}^2} \hat{r}_{ip}$$

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

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

$$\vec{r}_p = 0\hat{x} + L\hat{y} \quad \vec{r}_2 = L\hat{x} + 0\hat{y}$$

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

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

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

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

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

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

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

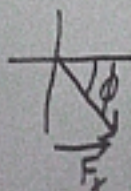
$$\vec{r}_{3p} = \vec{r}_p - \vec{r}_3$$

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

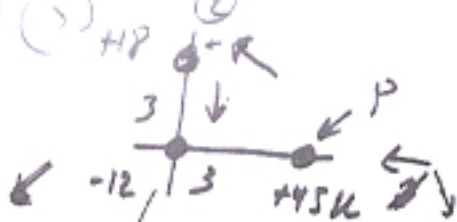
$$= 0\hat{x} + L\hat{y}$$

$$\begin{aligned}\vec{r}_{3P} &= \vec{r}_P - \vec{r}_3 \\ &= (0\hat{x} + L\hat{y}) - (0\hat{x} + 0\hat{y}) \\ &= 0\hat{x} + L\hat{y}\end{aligned}$$

$$\begin{aligned}\vec{F}_P &= R g_P \left[q_2 \frac{\vec{r}_{2P}}{|\vec{r}_{2P}|^3} + q_3 \frac{\vec{r}_{3P}}{|\vec{r}_{3P}|^3} \right] \\ &= R(-9\mu) \left[\begin{aligned} &(+8\mu) \cdot \frac{-0.15\hat{x} + 0.15\hat{y}}{(.15^2 + .15^2)^{3/2}} + \\ &(+3\mu) \frac{0\hat{x} + 0.15\hat{y}}{(0^2 + .15^2)^{3/2}} \end{aligned} \right]\end{aligned}$$



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



$$\textcircled{3} \quad \vec{r}_p = \vec{r}_1, \vec{r}_2, \vec{r}_3$$

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

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

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

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

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

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

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

$$(0\hat{x} + 0\hat{y})$$

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

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

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

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

$$(0x\hat{i} + 0y\hat{j})$$

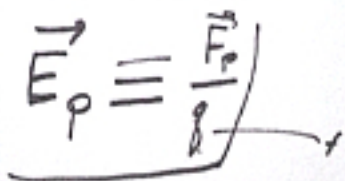
$$\vec{r}_{3p} = 3x\hat{i} + 0y\hat{j}$$

$$\vec{F}_p = k(+45N) \left[\right.$$

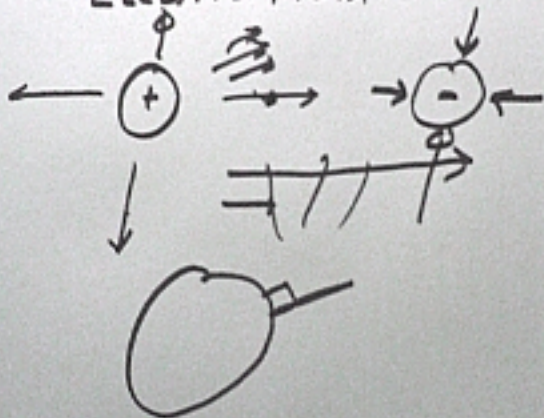
$$(+18N) \left(\frac{3x\hat{i} - 3y\hat{j}}{(3^2 + 3^2)^{3/2}} \right) +$$

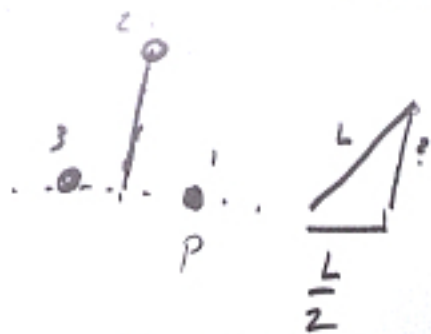
$$(-12N) \left(\frac{3x\hat{i} + 0y\hat{j}}{(3^2 + 0^2)^{3/2}} \right) \left. \right]$$

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$$\vec{E}_p \equiv \frac{F_{LE}}{q}$$


Electric Field





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

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

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

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

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

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

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

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

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

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

$$= L \hat{x}$$

$$\vec{F}_r = k q_1 q_2 \left[\frac{1}{r_2} + \frac{\left(\frac{L}{2} \hat{x} - \frac{\sqrt{3}}{2} \hat{y}\right)}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} \right]$$

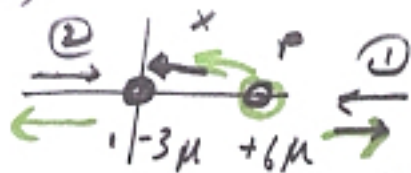
$$+ k q_3 \frac{(L \hat{x})}{(L^2 + 0^2)^{3/2}}$$

$$\begin{aligned}
 3a &= r_p - r_3 = \left(\frac{L}{2} - \frac{L}{2}\right) \hat{x} + (0 - 0) \hat{y} \\
 &= L \hat{x} \\
 &= R g_p \left[g_2 \frac{\left(\frac{L}{2} \hat{x} - \frac{\sqrt{3}}{2} \hat{y}\right)}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} \right. \\
 &\quad \left. + g_3 \frac{L \hat{x}}{(L^2 + 0)^{3/2}} \right]
 \end{aligned}$$

$$\begin{aligned}
 \vec{E}_p &= \frac{\vec{F}}{g_p} \\
 &= R g \left[\frac{\frac{L}{2} \hat{x} - \frac{\sqrt{3}}{2} \hat{y}}{\left(\left(\frac{L}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2\right)^{3/2}} + \frac{L \hat{x}}{(L^3)} \right]
 \end{aligned}$$

$$|\vec{E}| = \frac{V}{L}$$

(2)



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

$$\vec{r}_2 = 0\hat{x}$$

$$\begin{aligned}\vec{r}_{2p} &= \vec{r}_p - \vec{r}_2 = (1\hat{x}) - (0\hat{x}) \\ &= 1\hat{x}\end{aligned}$$

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