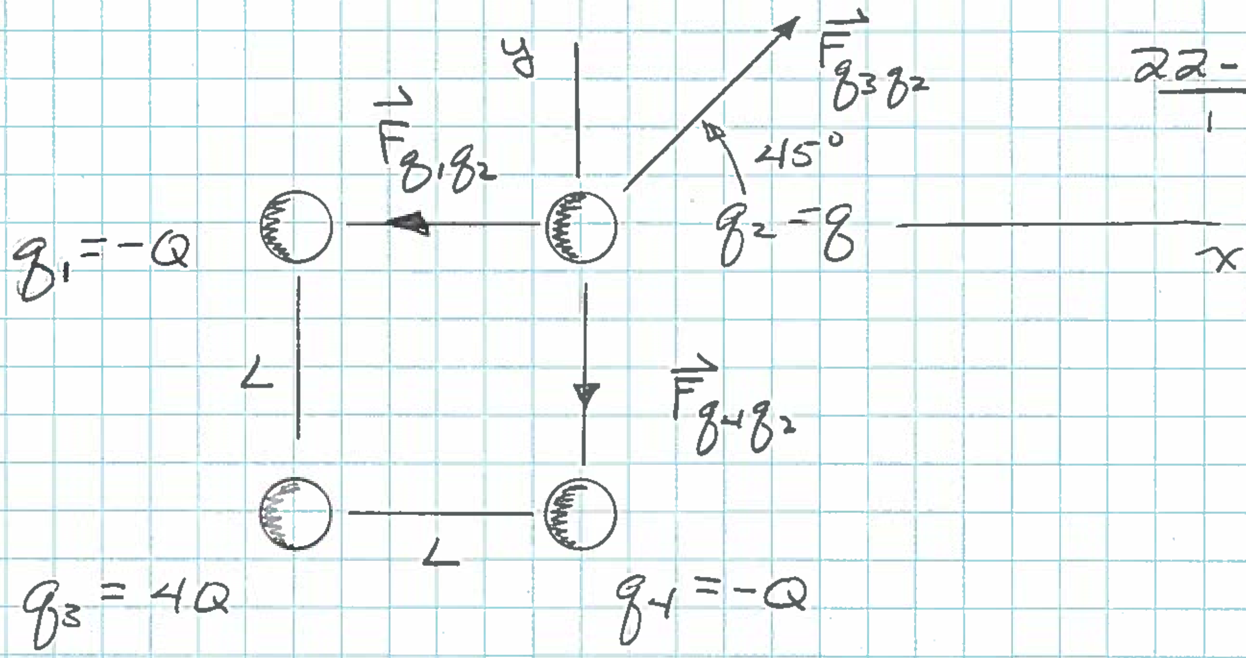
22-53
1




$$\vec F_{q_1q_2} = -\frac{K|q_1||q_2|}{r_{12}^2}\hat i = -\frac{KQq}{L^2}\hat i$$

$$\vec F_{q_4q_2} = -\frac{K|q_4||q_2|}{r_{42}^2} = -\frac{KQq}{L^2}\hat j$$

$\vec F_{q_3q_2}$ : $\quad r_{32}^2 = L^2 + L^2 = 2L^2$

$$|\vec F_{q_3q_2}| = \frac{K|q_3||q_2|}{r_{32}^2} = \frac{K4Qq}{2L^2}$$

$$\vec F_{q_3q_2} = \frac{K4Qq}{2L^2}\cos 45°\,\hat i + \frac{K4Qq}{2L^2}\sin 45°\,\hat j$$

$$\cos 45° = \sin 45° = 1/\sqrt{2}$$

$$\vec F_{q_3q_2} = \frac{2KQq}{\sqrt{2}L^2}\hat i + \frac{2KQq}{\sqrt{2}L^2}\hat j$$

$$\vec{F}_{TOTAL} = \vec{F}_{q_1 q_2} + \vec{F}_{q_4 q_2} + \vec{F}_{q_3 q_2}$$

$$= \left(\frac{2KQq}{\sqrt{2}L^2} - \frac{KQq}{L^2}\right)\hat{\imath} + \left(\frac{2KQq}{\sqrt{2}L^2} - \frac{KQq}{L^2}\right)\hat{\jmath}$$

$$= \frac{KQq}{L^2}\left(\sqrt{2} - 1\right)\hat{\imath} + \frac{KQq}{L^2}\left(\sqrt{2} - 1\right)\hat{\jmath}$$

$$= A\,\hat{\imath} + A\,\hat{\jmath}$$

and

$$|\vec{F}_{TOT}| = \sqrt{A^2 + A^2} = \sqrt{2}\,A$$

$$= \sqrt{2}\,\frac{KQq}{L^2}\left(\sqrt{2} - 1\right)$$