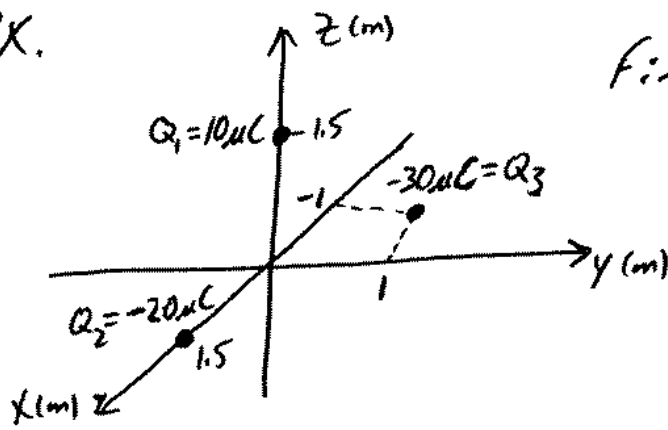


ex.



Find the force on charge Q_3 .

$$\vec{F}_Q = \sum_{k=1}^2 \vec{F}_{Q_k}$$

where
$$\vec{F}_Q = \frac{Q Q_k}{4\pi\epsilon_0} \frac{(\vec{r} - \vec{r}_k)}{|\vec{r} - \vec{r}_k|^3}$$

$$Q = Q_3 = -30 \mu\text{C}$$

1st Find force exerted by Q_1 on Q_3

source point position vector $\vec{r}_1 = +1.5 \hat{a}_z$ m

field point position vector $\vec{r} = -1 \hat{a}_x + 1 \hat{a}_y$ m

$$\vec{F}_{Q_1} = \frac{(-30 \mu\text{C})(10 \mu\text{C})}{4\pi(8.854 \times 10^{-12})} \frac{((-1 \hat{a}_x + 1 \hat{a}_y) - 1.5 \hat{a}_z)}{(\sqrt{(-1)^2 + (1)^2 + (-1.5)^2})^3}$$

$$= -0.30774 (-1 \hat{a}_x + 1 \hat{a}_y - 1.5 \hat{a}_z) \text{ (N)}$$

2nd Find force exerted by Q_2 on Q_3

source $\vec{r}_2 = +1.5 \hat{a}_x$

field $\vec{r} = -1 \hat{a}_x + 1 \hat{a}_y$

$$\vec{F}_{Q_2} = \frac{(-30 \mu\text{C})(-20 \mu\text{C})}{4\pi(8.854 \times 10^{-12})} \frac{((-1 \hat{a}_x + 1 \hat{a}_y) - 1.5 \hat{a}_x)}{(\sqrt{(-1-1.5)^2 + 1^2})^3}$$

$$= 0.276245 (-2.5 \hat{a}_x + 1 \hat{a}_y) \text{ (N)}$$

3rd Sum to get total force

$$\vec{F}_Q = \vec{F}_{Q_1} + \vec{F}_{Q_2}$$

$$= (0.30774 - 2.5(0.276245)) \hat{a}_x + (-0.30774 + 0.276245) \hat{a}_y$$

$$+ (1.5)(0.30774) \hat{a}_z$$

$$\vec{F}_Q = -0.3829 \hat{a}_x - 0.0315 \hat{a}_y + 0.4616 \hat{a}_z \text{ (N)}$$