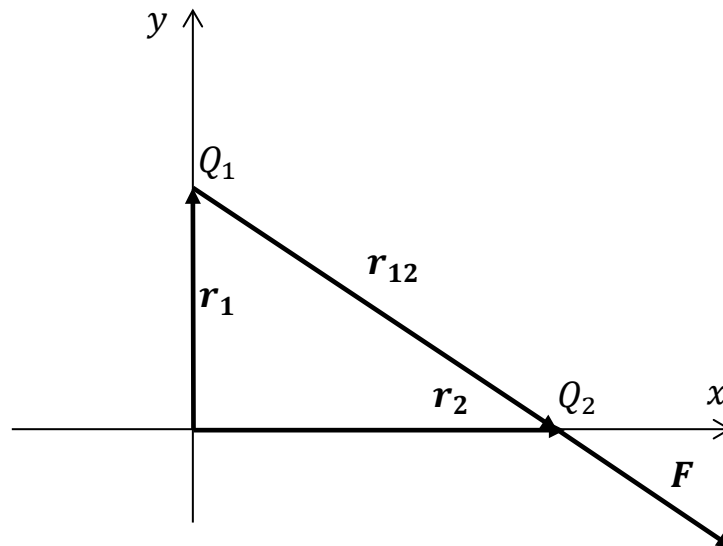


Answer on Question#51506 - Physics - Electromagnetism

Two charges $Q_1 = 500\mu\text{C}$ and $Q_2 = 100\mu\text{C}$ are located on the XY plane at the positions $\mathbf{r}_1 = 3\vec{j}$ m and $\mathbf{r}_2 = 4\vec{i}$ m. Find the force exerted on the Q_2 .

Solution:



The force exerted on the Q_2 is

$$\mathbf{F} = k_e \frac{Q_1 Q_2}{|\mathbf{r}_{12}|^3} \mathbf{r}_{12},$$

where $k_e = 8.9875 \cdot 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}$ — is Coulomb's constant, $\mathbf{r}_{12} = \mathbf{r}_2 - \mathbf{r}_1 = 4\vec{i}$ m $- 3\vec{j}$ m.

$$|\mathbf{r}_{12}| = \sqrt{4^2\text{m}^2 + 3^2\text{m}^2} = 5\text{m}$$

Therefore

$$\begin{aligned} \mathbf{F} &= k_e \frac{Q_1 Q_2}{|\mathbf{r}_{12}|^3} \mathbf{r}_{12} = 8.9875 \cdot 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2} \frac{500\mu\text{C} \cdot 100\mu\text{C}}{125\text{m}^3} (4\vec{i} \text{ m} - 3\vec{j} \text{ m}) = \\ &= 17.975\text{N} \cdot (0.5\vec{i} - 0.6\vec{j}) \end{aligned}$$

Answer: $\mathbf{F} = k_e \frac{Q_1 Q_2}{|\mathbf{r}_{12}|^3} \mathbf{r}_{12} = 17.975\text{N} \cdot (0.5\vec{i} - 0.6\vec{j})$.