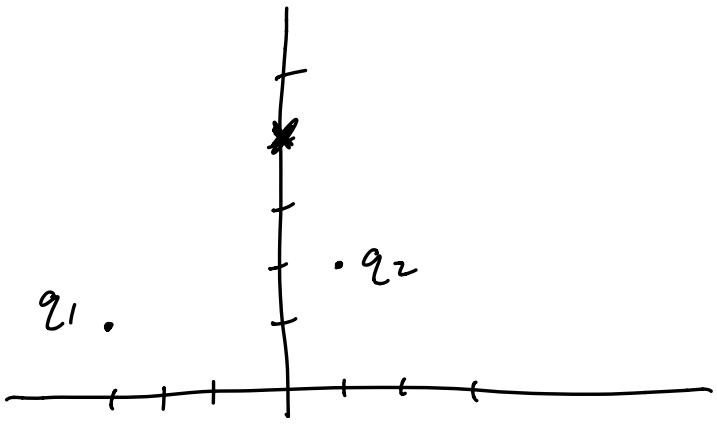
1) $q_1 = -2\,nC = -2\times10^{-9}\,C$ @ $\langle -3, 1\rangle \times10^{-3}\,m$

$q_2 = -6\times10^{-9}\,C$ @ $\langle 1, 2\rangle \times10^{-3}\,m$

$\vec{E}$ @ $\langle 0, 4\rangle \times10^{-3}\,m$?



$$\vec{E} = \vec{E}_1 + \vec{E}_2$$

a) E_1

$$\vec{E}_1 = \frac{k q_1}{|\vec{r}_1|^2}\,\hat{r}_1$$

$$\vec{r}_1 = \vec{r}_{obs} - \vec{r}_{src} = \langle 0, 4\rangle^{mm} - \langle -3, 1\rangle^{mm}$$

$$= \langle 3, 3\rangle \times10^{-3}\,m$$

$$|\vec{r}_1| = \sqrt{0.003^2 + 0.003^2}$$

$$|\vec{r}_1| = 0.0042\,m; \quad \hat{r}_1 = \frac{\langle 3, 3\rangle \times10^{-3}}{4.2\times10^{-3}}$$

$$\hat{r}_1 = \langle 0.714, 0.714\rangle$$

$$|\vec{r}_1|^2 = 1.8 \times 10^{-5}\ m^2$$

$$\vec{E}_1 = \frac{\left(9\times10^9 \frac{N m^2}{C^2}\right)\left(-2\times10^{-9} C\right)}{1.8\times10^{-5} m^2} \langle 0.714, 0.714\rangle$$

$$= \frac{-18 \frac{N}{C} m^2}{18\times10^{-6} m^2} = -10^6 \frac{N}{C} \langle 0.714, 0.714\rangle$$

$$\vec{E}_1 = \langle -7.14\times10^5, -7.14\times10^5\rangle \frac{N}{C}$$

b) $\vec{E}_2$

$$\vec{r}_2 = \vec{r}_{obs} - \vec{r}_{src}$$

$$= \langle 0, 4\rangle \times10^{-3} m - \langle 1, 2\rangle \times10^{-3} m$$

$$= \langle -1, 2\rangle \times10^{-3} m$$

$$|\vec{r}_2| = \sqrt{0.001^2 + 0.002^2}\ m = 0.0022\ m$$

$$\hat{r}_2 = \frac{\langle -1, 2\rangle \times10^{-3} m}{2.2\times10^{-3} m} = \langle -.45, 0.91\rangle$$

$$\vec{E}_2 = \frac{\left(9\times10^9 \frac{N^2}{C^2} m^2\right)\left(-6\times10^{-9} C\right)}{0.0022^2 m^2} \langle -.45, .91\rangle$$

$$= \frac{-54 \frac{N^2 m^2}{C}}{4.84 \times 10^{-6} m^2} \langle -.45, .91 \rangle$$

$$= -11.15 \times 10^6 \frac{N}{C} \langle -.45, .91 \rangle$$

$$\vec{E}_2 = \langle 5.02, -10.14 \rangle \times 10^6 \frac{N}{C}$$

c) $\vec{E} = \vec{E}_1 + \vec{E}_2$

$$\vec{E}_1 = \langle -7.14 \times 10^5, -7.14 \times 10^5 \rangle \frac{N}{C}$$

$$\boxed{\vec{E} = \langle 4.31, -10.85 \rangle \times 10^6 \frac{N}{C}}$$

2) $\vec{F}_3 = q_3 \vec{E}$

$$= (4 \times 10^{-9} C) \langle 4.31, -10.85 \rangle \times 10^6 \frac{N}{C}$$

$$\boxed{\vec{F}_3 = \langle 0.017, -0.043 \rangle N}$$