Phy220 Unquiz 01

Note: $k=8.99\text{x}10^{9}\frac{Nm^2}{C^2}$

Consider the following charges: 1:(+2μC;2,3),2:(-3μC;1,5)

(a) Find $\vec{E}$ and $|\vec{E}|$ at (7,2) with correct SI units.

(b) If a charge Q=-3μC is located at (7,2), find $\vec{F}$ and $|\vec{F}|$ with correct SI units.

Phy250 Unquiz 01

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Write down what you want to calculate: $\vec{E}=\sum_{i=1}^{i=2} k\,\frac{q_i}{r_{ip}^2}\hat{r}_{ip}$

Make a table

#	Q	x	y
1	2	2	3
2	-3	1	5
p		7	2

Identify the following vectors: $\vec{r}_p;\vec{r}_1;\vec{r}_2$

$\vec{r}_p=7\hat{x}+2\hat{y}:\vec{r}_1=2\hat{x}+3\hat{y}:\vec{r}_2=1\hat{x}+5\hat{y}$

Calculate the following vectors: $\vec{r}_{1p}:\vec{r}_{2p}$

$$\vec{r}_{1p}=\vec{r}_p-\vec{r}_1=(7\hat{x}+2\hat{y})-(2\hat{x}+3\hat{y})=(7-2)\hat{x}+(2-3)\hat{y}=5\hat{x}-1\hat{y}$$
$$\vec{r}_{2p}=\vec{r}_p-\vec{r}_2=(7\hat{x}+2\hat{y})-(1\hat{x}+5\hat{y})=(7-1)\hat{x}+(2-5)\hat{y}=6\hat{x}-3\hat{y}$$

Write down the electric field:

$$\vec{E}_p=k\mu\left[(+2)\frac{5\hat{x}-1\hat{y}}{[5^2+1^2]^{3/2}}+(-3)\frac{6\hat{x}-3\hat{y}}{[6^2+3^2]^{3/2}}\right]$$

simplify:

$$\vec{E}_p=k\mu\left[\frac{10\hat{x}-2\hat{y}}{26^{3/2}}+\frac{-18\hat{x}+9\hat{y}}{45^{3/2}}\right]=k\mu[(0.0754-0.0596)\hat{x}+(-0.0151+0.0298)\hat{y}]$$

$$\vec{E}_p=k\mu[0.0158\hat{x}+0.0147\hat{y}]=142.0\hat{x}+132.2\hat{y}\,\frac{N}{C}$$

Note kμ=8990

Find $\vec{F}$ from $\vec{F}=q_p\vec{E}$

$$\vec{F}=-3\text{x}10^{-6}\text{x}[142.0\hat{x}+132.2\hat{y}]=-0.000426\hat{x}-0.000397\hat{y}$$
$$\vec{F}=[-4.26\text{x}10^{-4}\hat{x}-3.97\text{x}10^{-4}\hat{y}]\text{N}$$