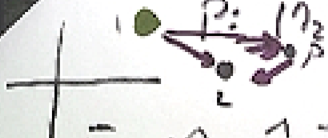
1: (+2μC; 2, 3)

2: (−3μC; 1, 5)

P: (7, 2)



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

$\vec{r}_{1p} = 5\hat{x} - 1\hat{y}$ $\vec{r}_{2p} = 6\hat{x} - 3\hat{y}$

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

$$= k\mu\left[\frac{10\hat{x} - 2\hat{y}}{[26]^{3/2}} - \frac{18\hat{x} - 9\hat{y}}{(45)^{3/2}}\right]$$

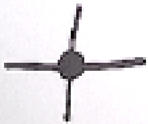
$$= k\mu\left[(.075\hat{x} - .059\hat{x}) + (-.015\hat{y} + .029\hat{y})\right]$$

$$= k\mu\left[.016\hat{x} + .014\hat{y}\right]$$

$$= 143\hat{x} + 126\hat{y}\ \frac{N}{C} \qquad \vec{F} = q\vec{E}$$

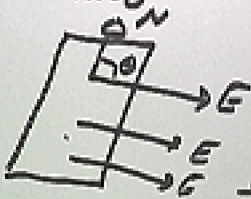
220
22

Gauss's law



$$\Phi_E = \frac{q_{enc}}{\varepsilon_0}$$

$$k = \frac{1}{4\pi\varepsilon_0} \Rightarrow \varepsilon_0 = \frac{1}{4\pi k}$$



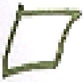
EAcos

$$\Phi = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta\vec{A}_i$$

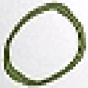
$$= EA\cos\theta$$

$$\vec{E}\cdot\vec{A} = EA$$

$\hat{r}$



$$\Phi_E = \frac{q_{enc}}{\epsilon_0}$$



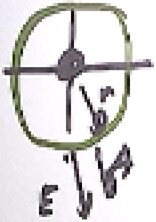
$$q_{enc} = q$$

$$\Phi_E = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta \vec{A}_i$$

on GS: E uniform, $\vec{E} \parallel \vec{A}$

$$\Phi_E = E \sum \Delta A_i = E(4\pi r^2)$$

$$E(4\pi r^2) = \frac{q}{\epsilon_0} \Rightarrow \vec{E} = \frac{q}{4\pi\epsilon_0 r^2}\hat{r}$$



$\vec{E}$

On GS: $\vec{E} \parallel \vec{A}$

$\vec{E}$ uniform

$$\Phi_E = \frac{q_{enc}}{\varepsilon_0}$$

$$\Phi_E = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta \vec{A}_i$$

$$= \sum_{\Delta A_i} E_i \cdot \Delta A_i = E \sum_{\Delta A_i} \Delta A_i$$

$q_{enc} = q$

$$= E(4\pi r^2)$$

$$E(4\pi r^2) = \frac{q}{\varepsilon_0}$$

$$\vec{E} = \frac{q}{4\pi \varepsilon_0 r^2} \hat{r}$$

$$\rho = \frac{Q}{\frac{4}{3}\pi a^3} \qquad \Phi_E = \frac{q_{enc}}{\varepsilon_0}$$

On G.S: $\vec{E} \parallel \vec{A}$

$\underline{r} > \underline{a}$

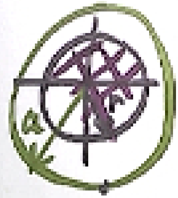
E uniform

$$\Phi_E = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta\vec{A}_i$$

$$= \sum_{\Delta A_i} E_i \,\Delta A_i = E_i \sum \Delta A_i$$

$$\Phi_E = E(4\pi r^2) \qquad q_{enc} = Q$$

$$E(4\pi r^2) = \frac{Q}{\varepsilon_0} \Rightarrow \vec{E} = \frac{Q}{4\pi\varepsilon_0 r^2}\hat{r}$$



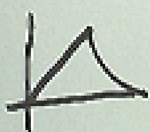
$$\Phi_E = \frac{Q_{enc}}{\varepsilon_0}$$

$$Q_{enc} = \rho \cdot \frac{4}{3}\pi r^3$$

$$\rho = \frac{Q}{\frac{4}{3}\pi a^3}$$

once: $\vec{E} \parallel \vec{A}$, E uniform

$$\Phi_E = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta\vec{A}_i = \sum_{\Delta A_i} E_i \Delta A_i$$



$$= E \sum_{\Delta A_i} \Delta A_i = E(4\pi r^2)$$

$$E(4\pi r^2) = \frac{Q}{\cancel{\frac{4}{3}\pi} a^3} \cdot \frac{\cancel{\frac{4}{3}\pi} r^3}{\varepsilon_0}$$

$$\vec{E} = \frac{Q}{\varepsilon_0} \cdot \frac{r}{4\pi a^3}\hat{r}$$

$$\Phi_E = \frac{Q_{enc}}{\varepsilon_0}$$

$$Q_{enc} = 0$$

$$\Phi_E = \sum_{\Delta A_i} \vec{E}_i \cdot \Delta \vec{A}_i = 0$$

$$\Rightarrow \vec{E}_{inside} = \vec{0}$$