Date

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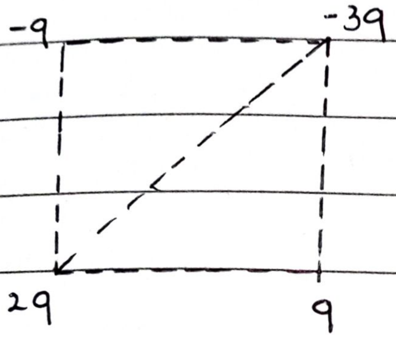
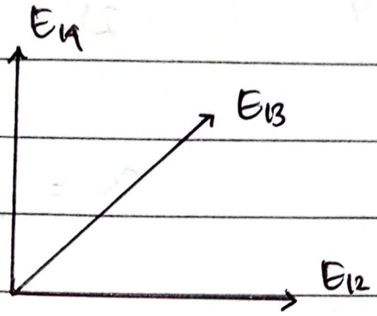
NPM : 2323022003

1.





$$E = k . \frac{q}{R^2}$$

$$E_{12} = \frac{k . q_2}{R_2^2} = \frac{k 2q}{a^2} = \frac{2kq}{a^2}$$

$$E_{13} = \frac{kq_3}{R_3^2} = \frac{k . 3q}{(a\sqrt{2})^2} = \frac{3kq}{2a^2}$$

$$E_{14} = \frac{kq_4}{R_4^2} = \frac{k . 4q}{a^2} = \frac{4kq}{a^2}$$

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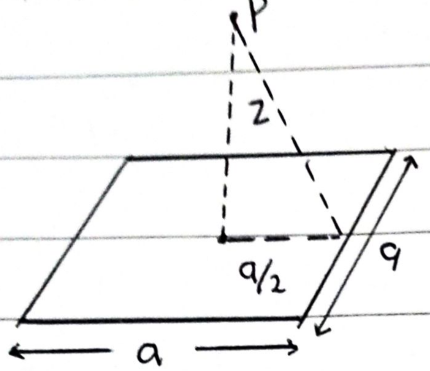
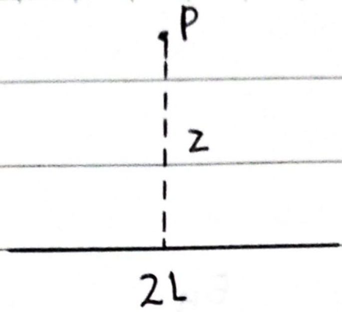
2.





$$E = \frac{k2\lambda L}{z\sqrt{z^2 + L^2}} \qquad \lambda = \frac{a}{4a}$$

$$E_a = \frac{k\lambda a}{r\sqrt{r^2 + (a/2)^2}}$$

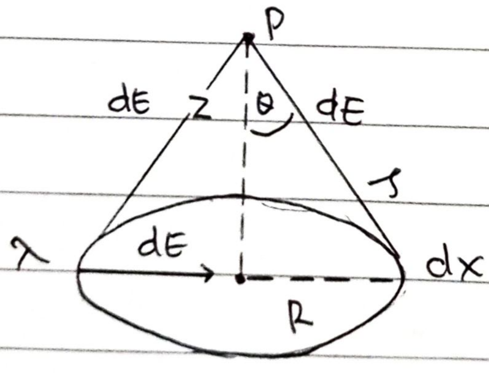
$$E_a = \frac{k\lambda a}{\sqrt{z^2 + a^2/4}\ \sqrt{z^2 + a^2/4 + a^2/4}}$$

$$E_a = \frac{k\lambda a}{\sqrt{z^2 + a^2/4}\ \sqrt{z^2 + a^2/2}}$$

$$E = 4\ E_a \sin\theta$$

$$E = 4\frac{k\lambda a}{\sqrt{z^2 + a^2/4}\ \sqrt{z^2 + a^2/a}} \cdot \frac{z}{\sqrt{z^2 + a^2/4}}$$

$$E = \frac{4k\lambda a z}{(z^2 + a^2/4)\sqrt{z^2 + a^2/2}}$$



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$$dE = \frac{k\,dq}{r^2}$$

$$dE_y = \frac{k\,dq}{r^2}\cos\theta$$

$$dE_y = \frac{k\lambda\,dx}{r^2}\;\frac{z}{r}$$

$$dE_y = \frac{k\lambda z\,dx}{r^3}$$

$$dE_y = \frac{k\lambda z\,dx}{(z^2+R^2)^{3/2}}$$

$$E_y = k\lambda z\int\frac{dx}{(z^2+R^2)^{3/2}}$$

$$E_y = \frac{k\lambda z}{(z^2+R^2)^{3/2}}\int_0^{2\pi R} dx$$

$$E_y = \frac{k\lambda z}{(z^2+R^2)^{3/2}}\cdot[x]_0^{2\pi R}$$

$$E_y = \frac{k\lambda z}{(z^2+R^2)^{3/2}}(2\pi R)$$

$$E_y = \frac{k.qz}{(z^2+R^2)^{3/2}}$$

If $z >> R$ Then $z^2+R^2 \approx z^2$

$$E_y = \frac{kqz}{(z^2)^{3/2}} = \frac{kq}{z^2}$$

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3. $E = \frac{1}{4\pi\epsilon_0 r^2} q \hat{r}$

$r > R$

$V(r) = -\int E \cdot dl$

$= \frac{-1}{4\pi\epsilon_0} \int_{\infty}^{r} \frac{q}{r'^2} dr'$

$= \frac{1}{4\pi\epsilon_0} \frac{q}{r'} \Big|_{\infty}^{r}$

$= \frac{1}{4\pi\epsilon_0} \frac{q}{r}$

$Q_{enc} = q$

$\int \vec{E} \cdot da = \frac{Q_{enc}}{\epsilon}$

$r < R$

$V(r) = \frac{-1}{4\pi\epsilon_0} \int_{\infty}^{R} \frac{q}{r'^2} dr' - \int_{R}^{r} (0)\, dr'$

$= \frac{1}{4\pi\epsilon_0} \frac{q}{r'} \Big|_{\infty}^{R} + 0$

$= \frac{1}{4\pi\epsilon_0} \frac{q}{R}$

OAKLEY

4. $\vec{E} = k s^3 \hat{s}$

$$\nabla \cdot \vec{A} = \frac{1}{s^2} \frac{\partial}{\partial s} (s^2 A_s) + \frac{1}{s \sin\theta} \cdot \frac{\partial}{\partial \theta} (\sin\theta \cdot A_\theta) +$$

$$\frac{1}{s \sin\theta} \cdot \frac{\partial}{\partial \phi} (A_\phi)$$

$$\nabla \cdot \vec{E} = \frac{1}{s^2} \frac{\partial}{\partial s} (s^2 E_s) + \frac{1}{s \sin\theta} \cdot \frac{\partial}{\partial \theta} (\sin\theta \, E_\theta) +$$

$$\frac{1}{s \sin\theta} \frac{\partial}{\partial \phi} (E_\phi)$$

a). ρ . . . ?

b). Q_{enc} . . . ?

$$\nabla \cdot \vec{E} = \frac{1}{s^2} \frac{\partial}{\partial s} (s^2 E_s) + 0 + 0$$

$$\nabla \cdot \vec{E} = \frac{1}{s^2} \frac{\partial}{\partial s} (s^2 k s^3)$$

$$\nabla \cdot \vec{E} = \frac{1}{s^2} \cdot \frac{\partial}{\partial s} (k s^5)$$

$$\nabla \cdot \vec{E} = \frac{1}{s^2} \cdot 5 k s^5$$

$$\nabla \cdot \vec{E} = 5 k s^2$$

$$\rho = E_0 \cdot 5 k s^2$$

$$\rho = 5 k E_0 s^2$$

Date

$$\rho = \frac{Q}{V}$$

$$Q = \rho V$$

$$Q = \int \rho \, dV$$

$$Q = \int 5k\varepsilon_0 s^2 \cdot 4\pi s^2 \cdot ds$$

$$Q = 20k\varepsilon_0 \pi \int s^4 \, ds$$

$$Q = 20k\varepsilon_0 \pi \cdot \frac{s^5}{5}$$

$$Q = 4k\varepsilon_0 \pi R^5$$