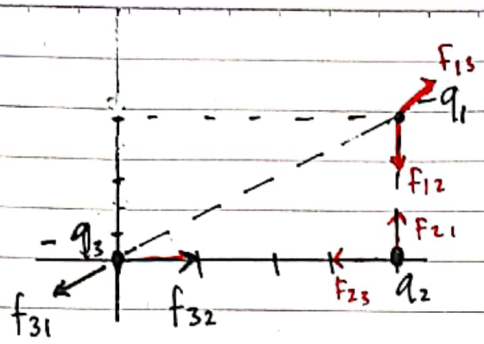
No. Senin

Date 18-03-2024



$\vec{F}_{31} = \frac{1}{4\pi} \frac{q_3 q_1}{5^2} \left(\frac{-4\hat{i} - 3\hat{j}}{5}\right)$

$\vec{F}_{32} = \frac{1}{4\pi} \frac{q_3 q_2}{4^2} \hat{i}$

$\vec{F}_{12} = k \frac{q_1 q_2}{3^2} \left(\frac{0\hat{i} + 3\hat{j}}{3}\right)$

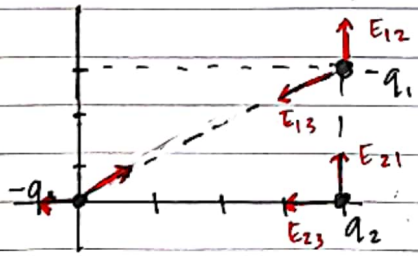
$\vec{F}_{12} = -k \frac{q_1 q_2}{3^2} \hat{j}$

$\vec{F}_{13} = k \frac{q_1 q_3}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5}\right)$

$\vec{F}_{21} = k \frac{q_2 q_1}{3^2} \hat{j}$

$F_{23} = k \frac{q_2 q_3}{4^2} (-\hat{i})$

Medan -> bergantung pada q yg membentuk medan
sifat negatif menuju, positif menjauhi



$\vec{E}_{32} = \frac{F}{q_3} = k \frac{q_3 q_2 / r^2}{q_3}$ $\vec{E}_{32} = k \frac{q_2}{4^2} (\hat{i})$

$= k \frac{q_2}{r^2}$

$\vec{E}_{31} = k \frac{q}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5}\right)$

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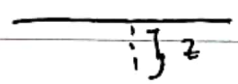
Muatan Non Distribusi → hanya berlaku pada medan

① $E = k\frac{q}{r^2}\hat{r}$

$= k\sum_{i=1}^{n}\frac{q_i}{r_i^2}\cdot\hat{r}_{oi}$

$= k\left[\sum_{i=1}^{n}\frac{q_1}{r_1^2}\hat{r}_{o1} + \frac{q_2}{r_2^2}\hat{r} + \dots + \frac{q_n}{r_n^2}\hat{r}_{on}\right]$

②  (garis)

$\vec{E} = k\int\frac{dq}{r^2}\cdot\hat{r}_o = k\int\frac{\sigma\,dx}{r^2}\hat{r}_o$ → medan pada kawat lurus

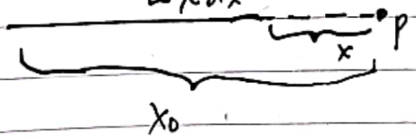
③. 

$\vec{E} = k\iint\frac{\sigma\,dq}{r^2}\hat{r}_o$ →

④. 

$\vec{E} = k\iiint\frac{\rho\,d\tau}{r^2}\hat{r}_o$ → Volume

Contoh

① 

$\vec{E}_p = \dots ?$

$\vec{E} = k\int_0^L\frac{\lambda\,dx}{(x_o-x)^2} = k\lambda\int_0^L\frac{dx}{(x_o-x)^2}$

$\int\frac{dx}{x^2} = \int_0^L x^{-2}\,dx$

$= x^{-1}\Big|_0^L = \frac{1}{x}\Big|_0^L$

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$$\vec{E} = k\int_0^L \frac{\lambda\, dx}{(x_0 - x)^2} = k\lambda \int_0^L \frac{dx}{(x_0 - x)^2}$$

$$= k\lambda \int_0^L (x_0 - x)^{-2}\, dx$$

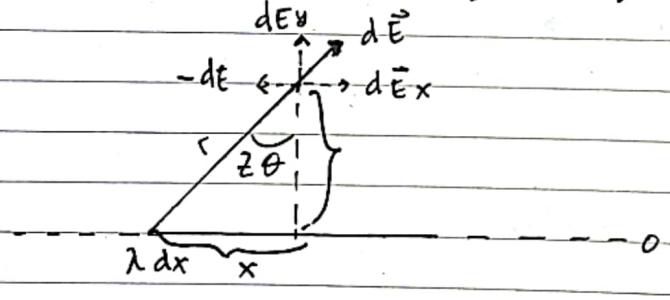
$$= k\lambda \left[\frac{1}{(x_0 - x)} \Big|_0^L \right]$$

$$= k\lambda \left[\frac{1}{(x_0 - L} - \frac{1}{(x_0 - 0} \right]$$

$$= k\lambda \left[\frac{x_0 - (x_0 - L)}{x_0\,(x_0 - L)} \right.$$

$$= \frac{L}{x_0(x_0 - L)}$$

2. Hitung medan listrik sejauh z di atas kawat lurus panjang dengan rapat muatan permukaan panjang λ yang homogen.



$$d\vec{E} = d\vec{E}_y + d\vec{E}_x$$

$$d\vec{E} = d\vec{E}_y$$

$$dE_y = dE \cos\theta$$

$$dq = \lambda\, dx$$

$$\vec{E} = k\int_{-\infty}^{\infty} \frac{\lambda\, dx}{r^2} \cos\theta$$

Misal :

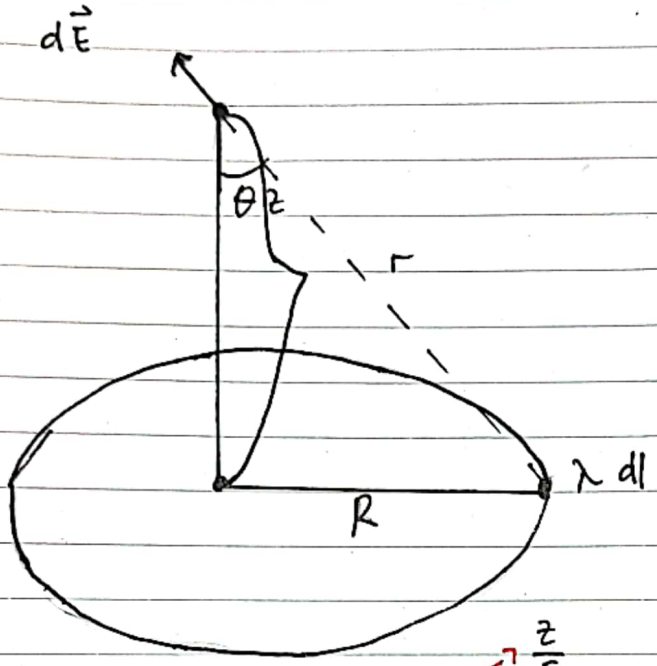
$$\cos\theta = \frac{z}{r}$$

$$r = \frac{z}{\cos\theta}$$

$\tan\theta = \frac{x}{z}$ $\quad dx = \frac{z}{\cos^2\theta}$ $\quad x = z\tan\theta$

$x = -\infty$, $\theta = -\pi/2$

$x = \infty$, $\theta = \pi/2$



$$\vec{E} = K\int_0^{2\pi R} \frac{\lambda\, dl}{(R^2+z^2)} \cos\theta \qquad \cos\theta = \frac{z}{r}$$

$$r = (z^2+R^2)^{1/2}$$

$$r^2 = (z^2+R^2)^{1/2}\cdot 2$$

$$= K\lambda z\int_0^{2\pi R} \frac{dl}{(R^2+z^2)^{3/2}}$$