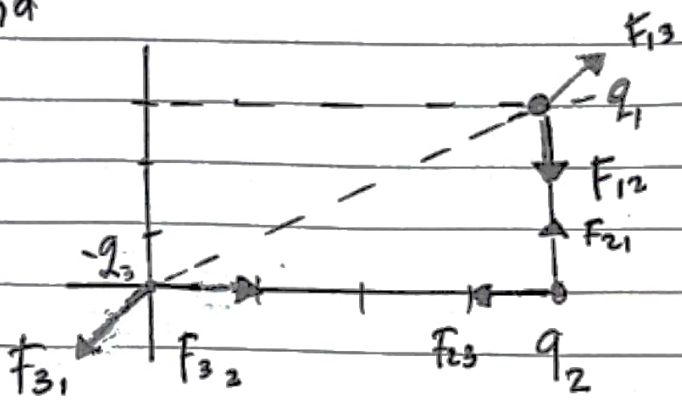
Nama : Dwi Pratiwi
NPM : 2213022027
Kelas : 22A

No
Date 18-03-2024

Kalisma



$$F_{31} = \frac{1}{4\pi\varepsilon_0} \frac{q_3 q_1}{5^2} \left(\frac{-4i - 3j}{5} \right)$$

$$F_{32} = \frac{1}{4\pi\varepsilon_0} \frac{q_3 q_2}{4^2} i$$

$$F_{12} = K \frac{q_1 - q_2}{3^2} \left(\frac{0\hat{i} + 3\hat{j}}{3} \right)$$

$$F_{12} = -K \frac{q_1 \cdot q_2}{3^2} \hat{j}$$

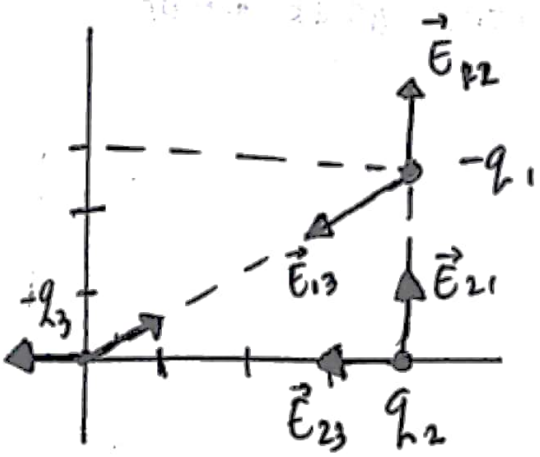
$$F_{13} = K \frac{q_1 \cdot q_3}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5} \right)$$

$$F_{21} = K \frac{q_2 \cdot q_1}{3^2} \left(\hat{j} \right)$$

$$= K \frac{q_2 \cdot q_1}{3^2} \hat{j}$$

$$F_{23} = K \frac{q_2 \cdot q_3}{4^2} \left(-\hat{i} \right)$$

→ Medan



Medan sumber yang menimbulkan

Negatif menuju

Positif akan menjauh

$$\vec{E}_{32} \quad \frac{F}{q_3} = K\frac{q_3 q_2 / r^2}{q_3}$$

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

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

$$\vec{E}_{32} = K\frac{q_2}{4^2}\left(-\hat{i}\right)$$

$$\vec{E}_{32} = K\frac{q_2}{4^2}(-\hat{i})$$

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→ Muatan Non Diskrit hanya berlaku untuk Medan

① $E = K \frac{q}{r^2} (\hat{r})$

$= K \sum_{i=1}^{n} \frac{q_i}{r_i^2} r_{0i}$

$= K \left[\sum_{i=1}^{\infty} \frac{q_1}{r_1^2} \hat{r}_0 + \frac{q_2}{r_2^2} r_{02} + \cdots + \frac{q_\infty}{r_\infty^2} r_{0\infty} \right]$

② ——— ijz

$\vec{E} = K \int \frac{dq}{r^2} = K \int \frac{x\,dx}{r^2} \hat{r}_0 \rightarrow$

Medan pada kawat listrik

③ ////////// $\vec{E} = K \iint \frac{\sigma\,dq}{r^2} \hat{r}_0$ → Luasan

④ → $\vec{E} = K \iiint \frac{dq}{r^2} \hat{r}_0$

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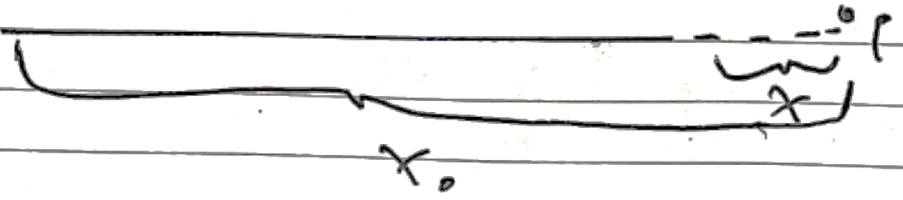
Latihan soal

1. Muatan terdistribusi pada garis dengan panjang tertentu (L), terletak pada sepanjang sumbu x dari $x = 0$ sampai $x = L$ densitas muatannya adalah $Q = \lambda L$. Hitung medan listrik pada titik P yang terletak pada $x_0 > L$!

Penyelesaian;



$EP = ?$

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

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

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

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

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

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

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

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

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

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

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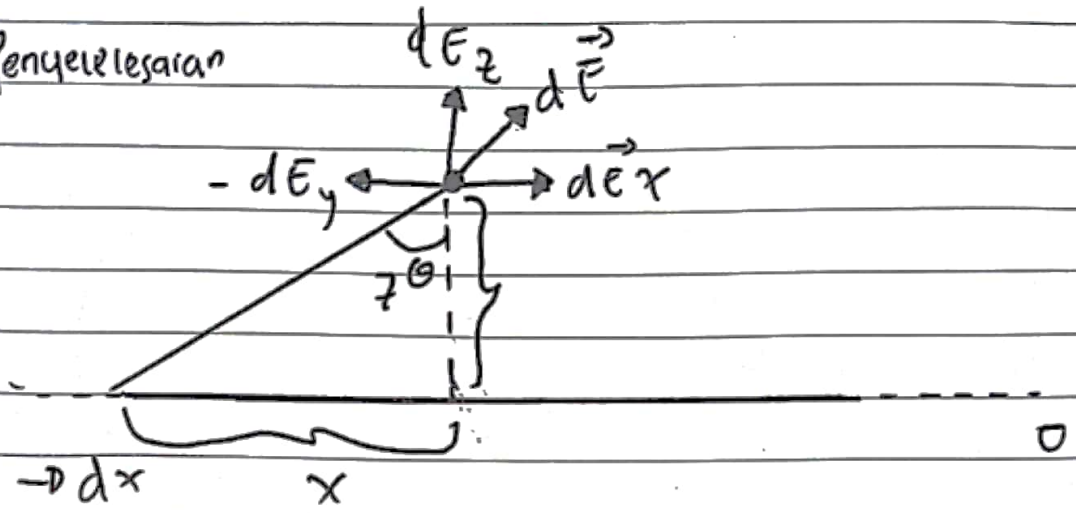
2. Hitung medan listrik sejauh z di atas kawat lurus panjang dengan rapat muatan persatuan panjang λ yang homogen

Penyelesaian



$$d\vec{E} = d\vec{E}y + d\vec{E}x$$

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

$$dEy = dE\cos\theta$$

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

$dq = \lambda dx$

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

$x = -\infty$

$\theta = -\frac{\pi}{2}$

$x = \infty$

$\theta = \frac{\pi}{2}$

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

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

$$\tan\theta = \frac{x}{z}$$

$$x = z\tan\theta$$

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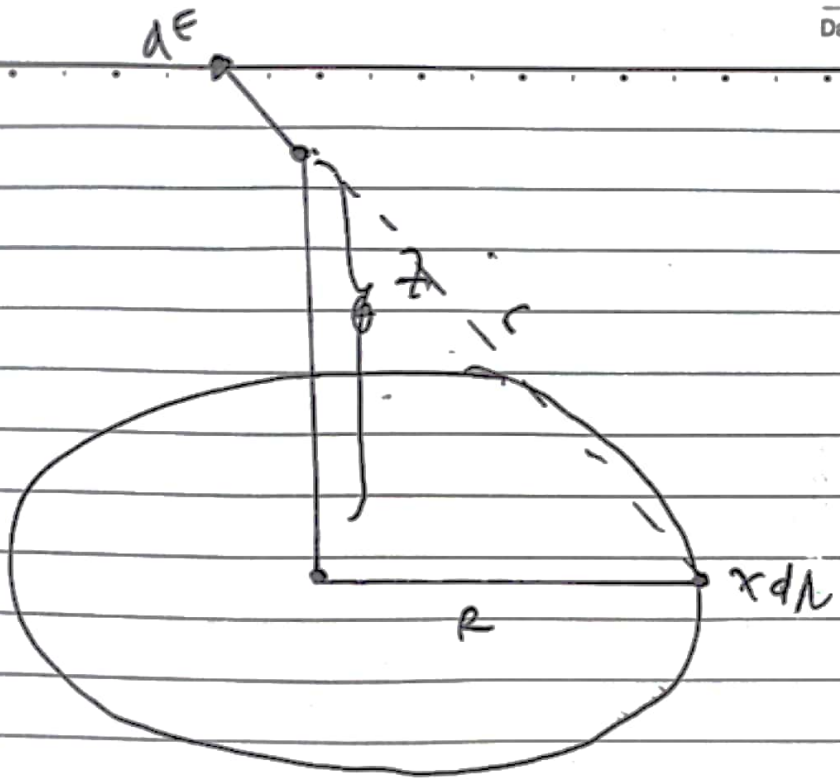

$$\vec{E} = K \int_0^{2\pi R} \frac{x\,d\lambda}{(R^2+z^2)} \cos\theta$$

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

$$\frac{z}{r} \rightarrow r = (z^2+R^2)^{\frac{1}{2}}$$

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