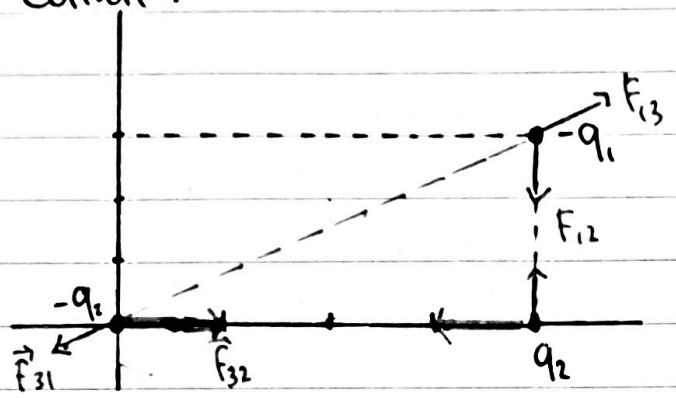
Nama : Herti Meylia Sari.
NPM/Kelas : 2213022031 / 22A

No
Date Senin, 18. Mar'. 2024.

→ Gaya.

Contoh :



$$\vec{F}_{31} = k \frac{q_3 . q_1}{r^2}$$

* $\vec{F}_{31} = \frac{1}{4\pi\mu_0} \frac{q_3 q_1}{5^2} \left(\frac{-4\hat{i} - 8\hat{j}}{5} \right)$

* $\vec{F}_{32} = \frac{1}{4\pi\mu_0} \frac{q_3 q_2}{4^2} \hat{i}$

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

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

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

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

* $\vec{F}_{23} = k \frac{q_2 . q_3}{4^2} (-\hat{i})$

$= -k \frac{q_2 . q_3}{4^2} \hat{i}$

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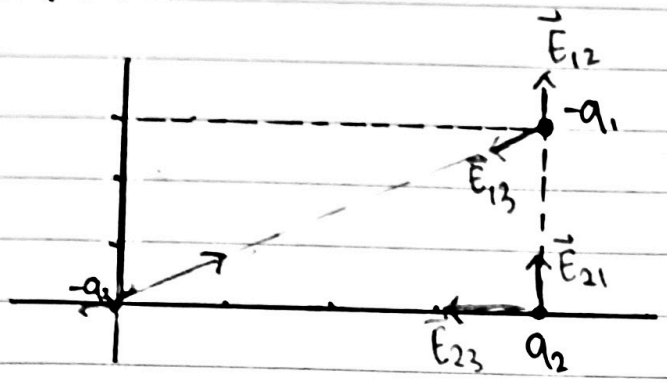
→ Medan



Medan sumber yang menimbulkan.
Sifat-sifat muatan:
Negatif menuju
Positif akan menjauh.

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

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

Karena sebenarnya q_2, maka q_3 menjauhi q_2. Sedangkan pada $-q_1$ mendekati.

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

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

→ Muatan Non diskrit hanya Berlaku untuk Medan.

1. $E = k \frac{q}{r^2} \hat{r}$

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

$= k \left[\sum_{i=1}^{n} \frac{q_1}{r_1^2} \hat{r}_{o1} + \frac{q_2}{r_2^2} \hat{r}_{o2} + \cdots + \frac{q_n}{r_n^2} \hat{r}_{on} \right]$

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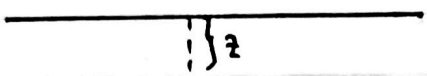
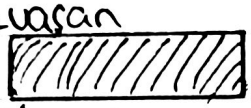
2. Medan pada kawat lurus.



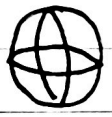
$$\vec{E} = k\int \frac{dq}{r^2}\,\hat{r}_0 = k\int \frac{\lambda\, dx}{r^2}\,\hat{r}_0$$

3. Luasan



$$\vec{E} = k\iint \frac{\sigma\, dq}{r^2}\,\hat{r}_0$$

4. Volume



$$\vec{E} = k\iiint \frac{\rho\, dr}{r^2}\,\hat{r}_0$$

$\vec{E} = (\,)\, q_1$

$\vec{E} = \int (\,)\, \lambda\, dp$

$\vec{E} = \iint (\,)\, \sigma\, dq$

$\vec{E} = \iiint (\,)\, \rho\, dr$

↳ $\frac{k}{r^2}$

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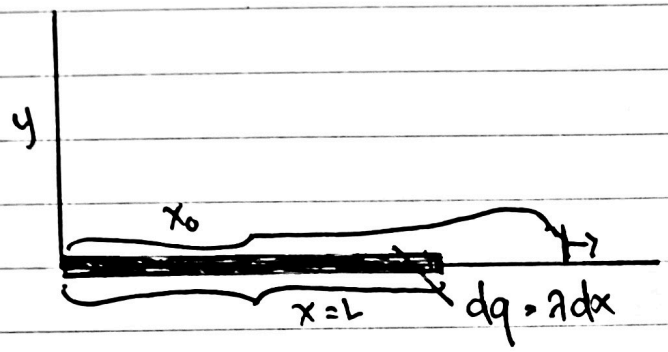
Latihan soal :

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



$$\vec{E} = k \int_0^L \frac{dq}{r^2}$$

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

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

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

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

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

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

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

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

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

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

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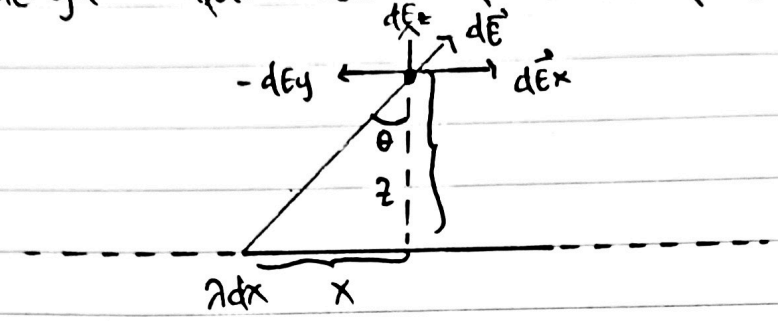
2. Hitung medan listrik sejauh z di atas kawat lurus panjang dengan rapat muatan persatuan panjang λ yang homogen.



$$d\vec{E} = d\vec{E}_y + \overset{0}{\cancel{d\vec{E}_x}}$$

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

$$dE_y = dE \cos\theta \rightarrow dq = \lambda dx$$

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

(Misalkan: $\cos\theta = \frac{z}{r}$

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

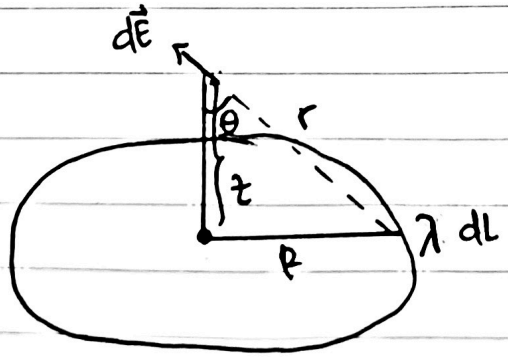
$\tan\theta = \frac{x}{z}$

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

$x = -u \rightarrow \theta = -\frac{\pi}{2}$

$x = u \rightarrow \theta = \frac{\pi}{2}$.

3.



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$$\vec{E} = k \int_0^{2\pi R} \frac{\lambda dL}{(R^2 + z^2)} \cos\theta$$

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

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

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