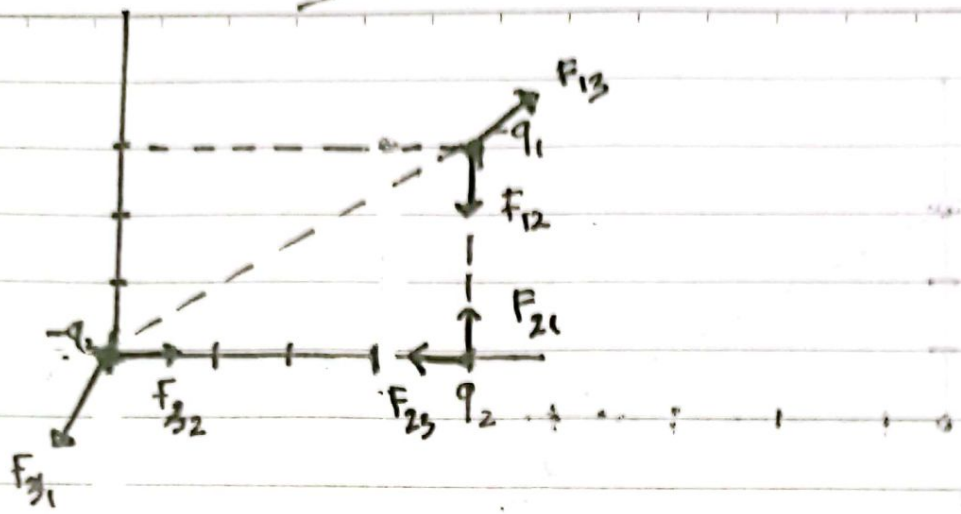
Date . .

Gaya



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

$$\vec{F}_{32} = \frac{1}{4\pi\varepsilon_0} \frac{q_3 q_2}{4^2}$$

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

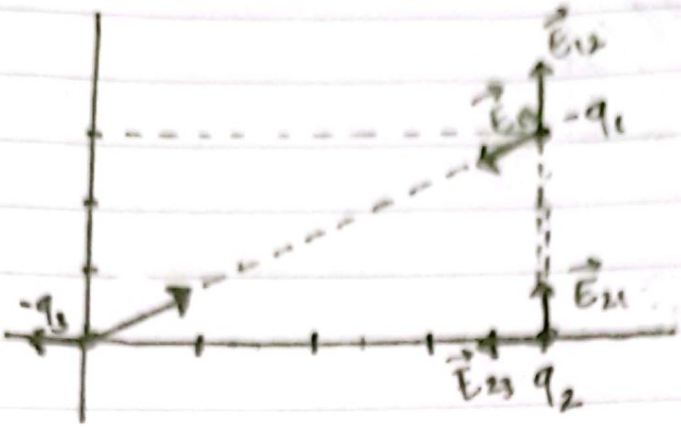
$$\vec{F}_{12} = K \frac{q_1 q_2}{5^2} \left(\frac{4\hat{i} + 3\hat{j}}{5} \right)$$

$$\vec{F}_{23} = K \frac{q_2 q_1}{4^2} (-\hat{j})$$

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

aya :

Medan



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

$$= K \frac{q_3 q_1 / r^2}{q_3}$$

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

(1.) $$E = K \frac{q}{r^2} \hat{r}$$

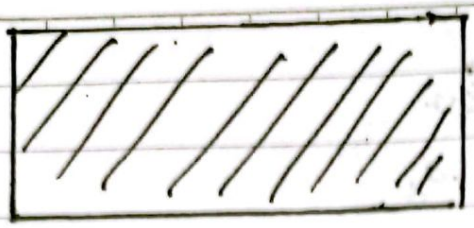
$$= K \sum_{i=1}^{n} \frac{q_1}{r_1^2} \hat{r}_1$$

$$= K \left[\sum_{i=1}^{n} \frac{q}{r^2} \hat{r}_1 + \frac{q_2}{r_2^2} \hat{r}_2 + \ldots + \frac{q_n}{r_n^2} \hat{r}_n \right]$$

(2.) $$\vec{E} = K \int \frac{dq}{r^2} \hat{r}_0 = K \int \frac{\lambda \, dx}{r^2} \hat{r}_0$$

(Medan pada kawat lurus)

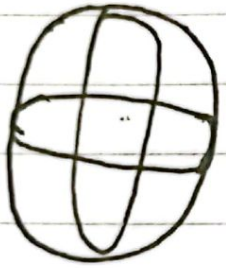
3.)



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

(Muatan kontinu pada bidang/permukaan)

4.)

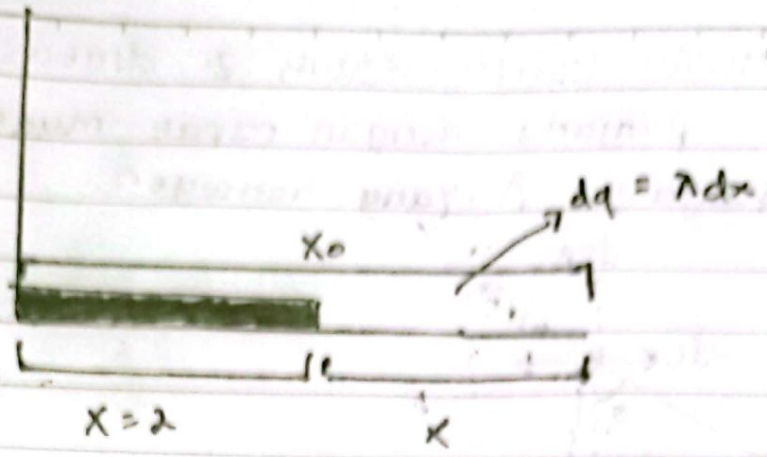


$$\vec{E} = K \iiint \frac{\rho d\tau}{r^2} \hat{r}_0$$

(Muatan kontinu pada volume)

Contoh 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 $Q = \lambda L$. Hitung medan listrik pada titik P yang terletak pada $x_0 > L$!



① $\vec{E} = \frac{1}{4\pi\varepsilon_0} \int_0^L \frac{\lambda\, dx}{r^2} \cdot r_0 = \frac{1}{4\pi\varepsilon_0} \int_0^L \frac{x\, dx}{(x_0 - x_2)^2}$

② $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} \int_0^L (x_0 - x)^2\, dx$

⑤ $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} \left[-\frac{1}{x_0 - (L)} - \left(-\frac{1}{x_0 - (0)} \right) \right]$

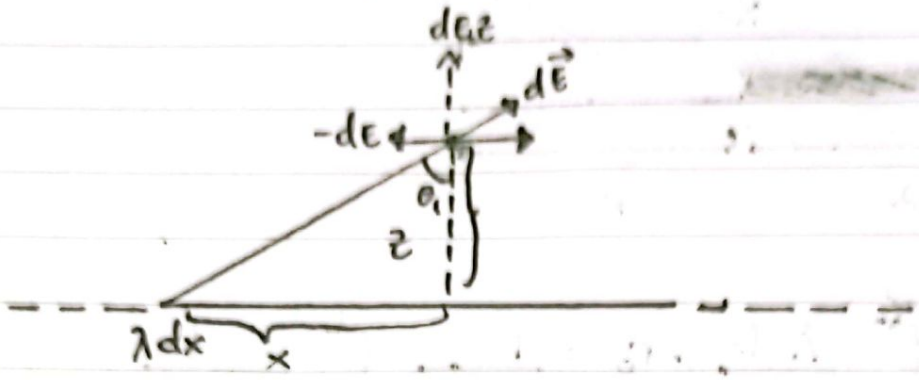
⑥ $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} \left(-\frac{1}{x_0 - L} + \frac{1}{x_0} \right)$

⑦ $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} \left(-\frac{1}{x_0 - L} + \frac{1}{x_0 - L} \right)$

③ $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} - \frac{1}{1} (x_0 - x)^{-1} \Big|_0^L$

④ $\vec{E} = \frac{\lambda}{4\pi\varepsilon_0} \left[-\frac{1}{x_0 - x} \Big|_0^L \right]$

(2.) Hitunglah medan listrik sejauh z diatas kawat lurus panjang dengan rapat muatan persatuan panjang λ yang homogen



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

$$d\vec{E} = dE \cos\theta$$

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

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

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

$$tg\,\theta = \frac{x}{z}$$

$$x = z\, tg\,\theta$$

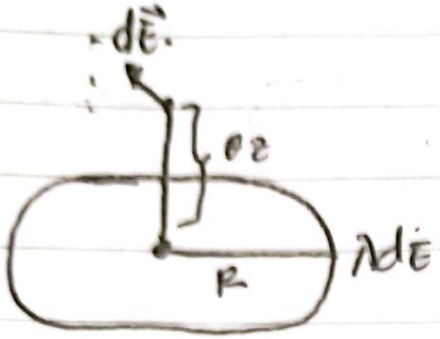
$$dx = \frac{z}{\cos^2\theta}$$

$$x = -\infty$$

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

$x = \infty$

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



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

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

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

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