Risnawati Hutapea
221302079

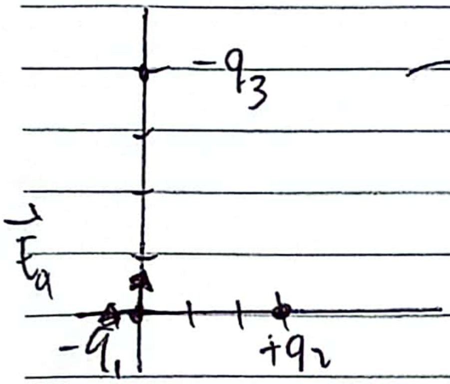
No. Senin

Date 18 . 03 . 2024

Catatan Pert 5.

Medan listrik ($\vec{E}$)

+q　　　　　　-q



$$\rightarrow \vec{E}_1 = \frac{\Sigma \vec{F}}{q_1}$$

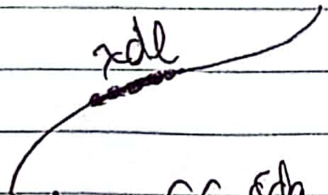
$$= \frac{F_{q_3}}{q_1} + \frac{F_{q_2}}{q_1}$$

$$\vec{E} = k\frac{q_3}{r^2} + k\frac{q_2}{r^2}$$

1. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \hat{r}$

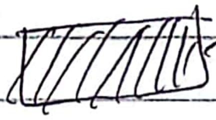
   $= k\frac{q}{r^2} \hat{r}_0$ → oleh muatan deskrit → tidak saling berhubungan

2. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \int \frac{\lambda dl}{r^2} \hat{r}_0 \rightarrow q = \lambda l$ → Muatan terdistribusi pada penggaris



3.

3. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \iint \frac{\sigma dq}{r^2} \hat{r}_0$



→ luas permukaan

4. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \iiint \frac{\rho dG}{r^2} \hat{r}_0$

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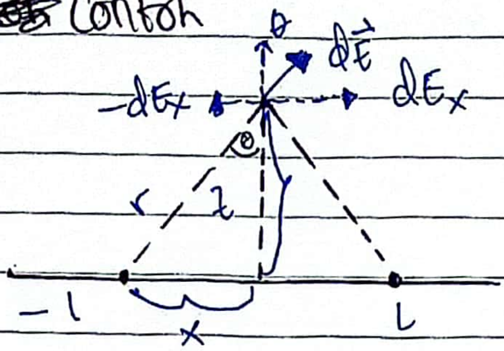
~~[illegible]~~ Contoh



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

$$d\vec{E} = dE_y + dE_x$$

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

$$dE_y = dE \cos\theta$$

$$E = \frac{1}{4\pi\varepsilon_0} \int_{-l}^{l} \frac{\lambda dl}{r^2} \cos\theta$$

$$= \frac{2}{4\pi\varepsilon_0} \int_{0}^{l} \frac{\lambda dx}{(x^2+z^2)} \cos\theta$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0} \int_{0}^{l} \frac{\lambda dx}{(x^2+z^2)} \cos\theta \qquad = \frac{x}{z^2\sqrt{x^2+z^2}}$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0} \int_{0}^{l} \frac{dx}{(x^2+z^2)^{3/2}}$$

$$= \boxed{\frac{2\lambda z}{4\pi\varepsilon_0}} \left[\frac{dx}{(x^2+z^2)^{3/2}}\right]\Big|_0^l$$

$$= \boxed{\frac{2\lambda z}{4\pi\varepsilon_0}} \left[\frac{l}{z^2\sqrt{l^2+z^2}} - \frac{0}{z^2\sqrt{0+z^2}}\right]$$

$$= \boxed{\frac{2\lambda z}{4\pi\varepsilon_0}} \left[\frac{l}{z^2\sqrt{l^2+z^2}}\right]$$

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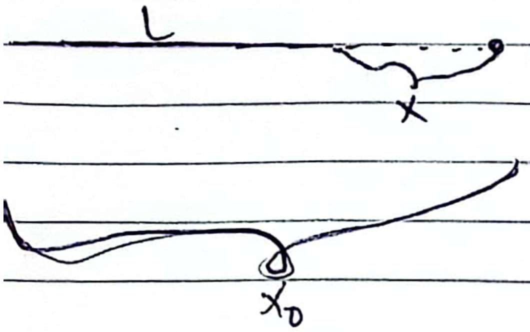

$$\vec{E} = \frac{1}{4\pi\varepsilon_0}\lambda\int_0^L \frac{x\,dx}{(x_0 - x)^2}$$

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

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

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

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

kali kesini   kali kesini

$$\frac{1}{(x_0 - \ell)} \quad \frac{1}{(x_0 - 0)}$$

dikali

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

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

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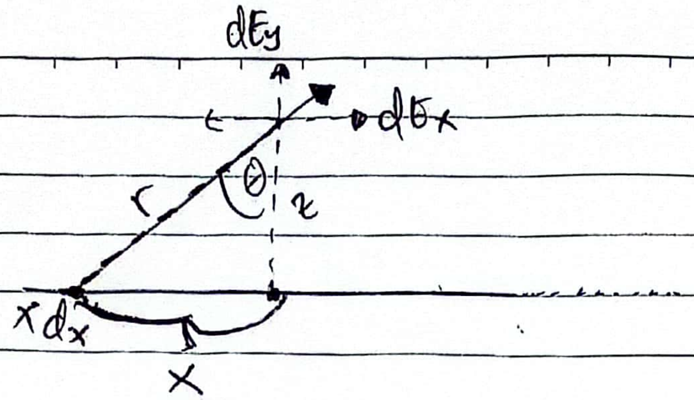

$\vec{E} = \vec{E}x + \vec{E}y$

$\vec{E} = \frac{1}{4\pi\varepsilon_0} \int_{-\infty}^{\infty} \frac{\lambda dx}{r^2} \cos\theta$

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

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

$dx = \frac{z}{\cos^2\theta} \to x = -\infty$

$\theta = -\pi/2$

$x = \infty \to \theta = \frac{\pi}{2}$

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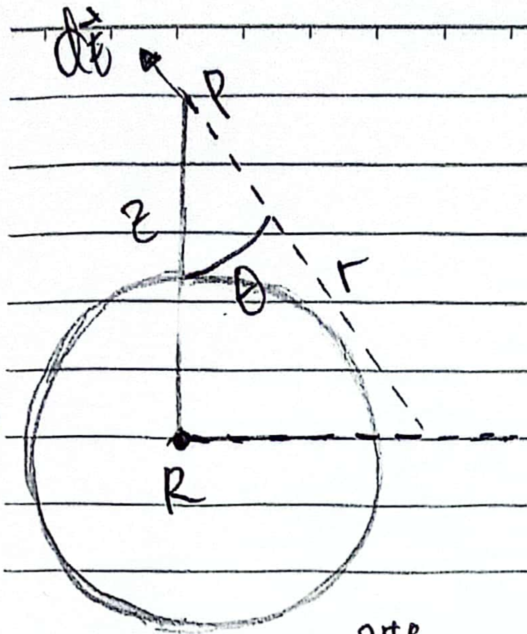

$$\vec{E} = \frac{1}{4\pi\varepsilon_0} \int_0^{2\pi R} \frac{z\lambda\, dl}{(z^2+R^2)^{3/2}}$$

$$= \frac{z\lambda}{4\pi\varepsilon_0 (z^2+R^2)^{3/2}} \int_0^{2\pi R} dl$$

$$= \frac{z\lambda}{4\pi\varepsilon_0 (z^2+R^2)^{3/2}} (l) \Big|_0^{2\pi R}$$

$$= \frac{z\lambda}{4\pi\varepsilon_0 (z^2+R^2)^{3/2}} (2\pi R)$$