No. Senin

KALISMA

Date 18 . 03 . 2024

Listrik dan Kemagnetan

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

$= k \frac{q}{r^2} r_0^2$ → Oleh muatan titik

2. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \int \frac{x\,dq}{r^2} r_0^2$ → $q = x\,l$ → Muatan titik distribusi pada Pada Penggaris

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

4. $\vec{E} = \frac{1}{4\pi\varepsilon_0} \iiint \frac{\rho\,d\theta}{r^2} r_0^2$

Contoh 1:

$d\vec{E} = dE_y +$

$d\vec{E} = dE_y$

$dE_y = dE \cos\theta$

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

$= \frac{2}{4\pi\varepsilon_0} \int_0^l \frac{x\,dx}{(x^2+z)^{2}\cdot\frac{1}{2}}$

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$$= \frac{2}{4\pi\varepsilon_0} \int_0^L \frac{dx}{(x^2+z^2)^{3/2}} \rightarrow \int \frac{dx}{(x^2+z^2)^{3/2}} = \frac{x}{z^2\sqrt{x^2+z^2}}$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0} \left(\frac{x}{z^2\sqrt{x^2+z^2}} \right) \Big|_0^L$$

$$= \frac{2\lambda z}{4\pi\varepsilon_0} \frac{1}{z^2\sqrt{x^2+z^2}} - \frac{0}{z^2\sqrt{0+z^2}}$$

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

Contoh 2:

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

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

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

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

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

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

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

untuk memoleh ini menggunakan

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

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

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

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Kalkulus

Contoh 3:

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

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

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

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

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

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

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