No. 18.3.24

Date

Kelistrikan dan Kemagnetan

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

$= k \frac{q}{r^2} \cdot \hat{r}_0$ → oleh muatan diskrit

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

$= q = \lambda l$ → Muatan berdistribusi pd Penggaris

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

[////////////] ↑ Luas Pemutaran

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

terkini pada Volume

Contoh soal Hal 50

1. Muatan berdistribusi dengan panjang tertentu (L) muatan seragam Q terletak pada ~~Penggaris~~ garis ȳ panjangnya L. di sepanjang sumbu x, x = 0 sampai x = L
densitas muatan Q = λL. Hitung medan listrik pada titik P. ȳ terletak pada $x_0 > L$!

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

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

$$= \frac{\lambda}{4\pi\varepsilon_0}(x_0 - x)^{-1}\Big|_0^2$$

$$= \frac{\lambda}{4\pi\varepsilon_0}\left(\frac{1}{x_0 - x}\right)\Big|_0^2$$

$$= \frac{\lambda}{4\pi\varepsilon_0}\left(\frac{1}{x_0 - 2} - \frac{1}{x_0 - 0}\right)$$

$$= \frac{\lambda}{4\pi\varepsilon_0}\left(\frac{1}{x_0 - 2} - \frac{1}{x_0}\right)$$

$$= \frac{\lambda}{4\pi\varepsilon_0}\left(\frac{2}{x_0(x_0 - 2)}\right)$$

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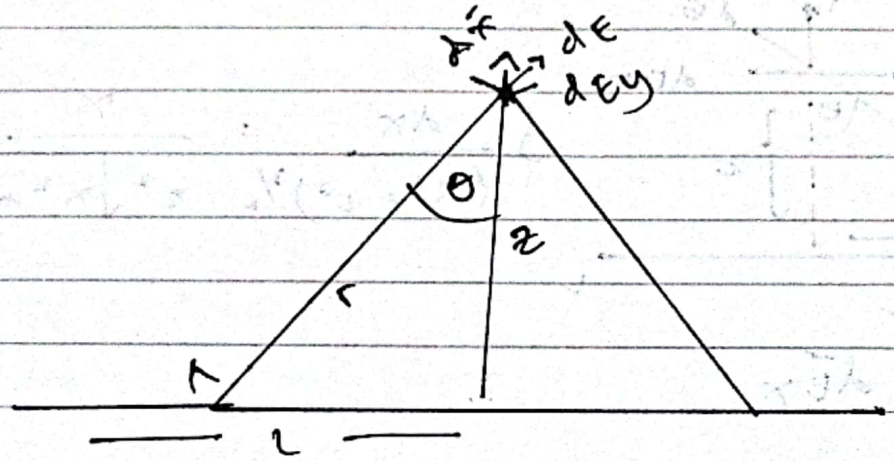
Soal no 2 hal 51

Hitung medan listrik sejauh z panjang λ = homogen



$x = -\theta_0$ $\quad \cos\theta = \frac{z}{r}$ $\quad \tan = \frac{x}{z}$

$\theta = -\frac{\pi}{2}$ $\quad r = \frac{z}{\cos\theta}$ $\quad x = z \tan\theta$

$\theta_0 = \pi/2$

$dx = \cos^2\theta$

$\vec{E} = dEx + dEy$

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

$$= \frac{\lambda}{4\pi\varepsilon_0} \int_{-\theta}^{\theta} r^2\, dx \cos\theta$$

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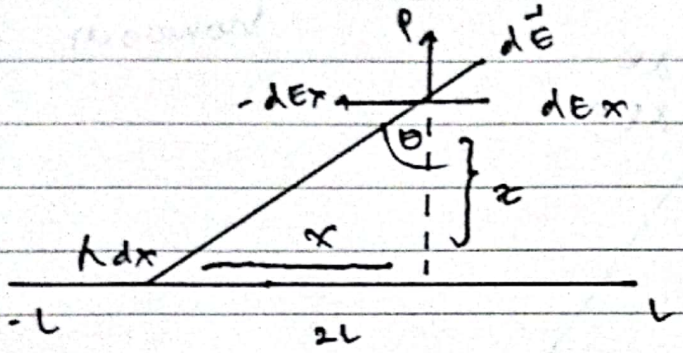
soal no. 3 hal 52

hitunglah medan listrik di titik P



$$\int \frac{dx}{(x^2+z^2)^{3/2}} = \frac{x}{z^2\sqrt{x^2+z^2}}$$

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

$$= dE_y$$

$$dE_y = dE \cos\theta$$

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

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

$$\vec{E} = \frac{2\lambda z}{4\pi\varepsilon_0} \int_{0}^{L} \frac{dx}{(x^2+z^2)^{5/2}}$$

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

$$= \frac{2\lambda z}{2\pi\varepsilon_0} \left(\frac{L}{L^2\sqrt{L^2+z^2}} \right) - 0$$

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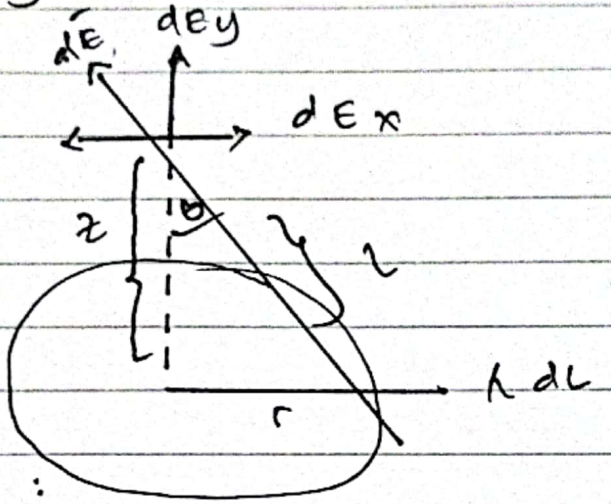
Soal no. 3 hal 53

3. Hitung medan listrik



Jawab :

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

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

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

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

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