No
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hukum Gauss.

$$\oiint \vec{E}\, ds = \iiint \nabla \vec{E}\, d\vec{v} \qquad E = \frac{q}{4\pi\varepsilon_0 r^2}$$

$$\oint_S \vec{E}\, ds = \int_V \nabla \cdot \vec{E}\, d\vec{v} \longrightarrow r$$

$$\oint \vec{E}\, ds = \frac{1}{4\pi\varepsilon_0} \int_0^{2\pi}\int_0^{\pi} \frac{Q}{r^2} r^2 \sin\theta\, d\theta\, d$$

$$= \frac{1}{4\pi\varepsilon_0} 2\pi \int_0^{\pi} Q \sin\theta\, d\theta$$

$$= \frac{Q\,(2\pi)}{4\pi\varepsilon_0} \left[-\cos\theta \Big|_0^{\pi} \right]$$

$$= \frac{4\pi Q}{4\pi\varepsilon_0} = \frac{Q}{\varepsilon_0}.$$

$$\oint \vec{E}\, ds = \frac{Q}{\varepsilon_0}.$$

$$\iiint \nabla E\, d\vec{v} \longrightarrow \boxed{\frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}} \longrightarrow Q = \rho\, dv.$$

$$= \frac{1}{4\pi\varepsilon_0} \iiint \nabla \left(\frac{\hat{r}}{r^2}\right) \rho\, dv$$

$$= \frac{1\,\rho}{4\pi\varepsilon_0} \int_V \left(\frac{\hat{r}}{r^2}\right) dv \longrightarrow \int_V \delta\, dv = 1$$

$$= \frac{\rho}{4\pi\varepsilon_0} \left[4\pi (\delta\, dv) \right]$$

$$= \frac{4\pi\rho}{4\pi\varepsilon_0} \longrightarrow \nabla \vec{E} = \frac{\rho}{\varepsilon_0}.$$

operator.

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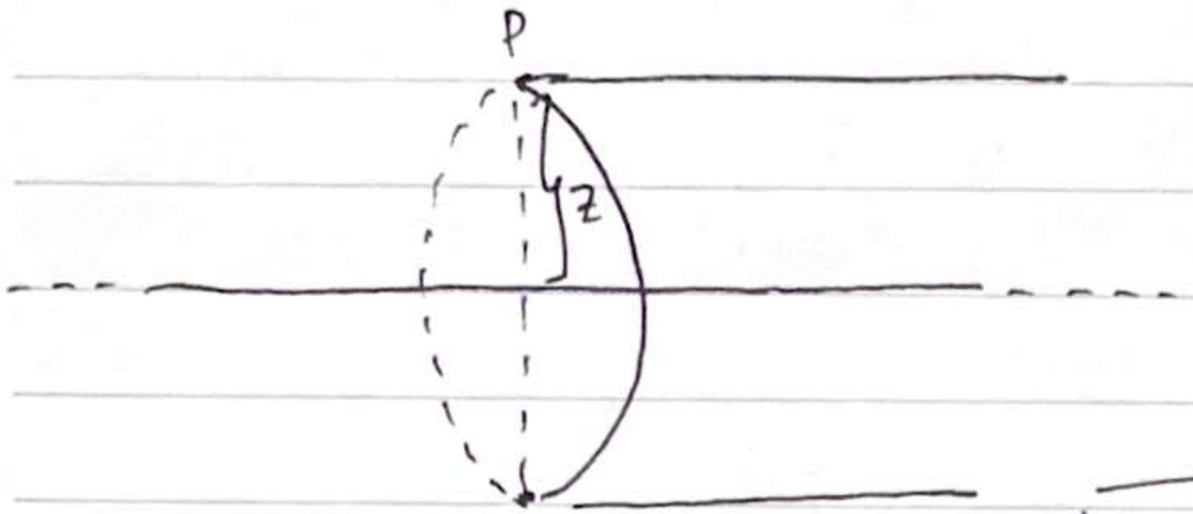
Contoh :

1) Hitung medan listrik pada kawat lurus sepanjang z.



$Q = \lambda l$.

$Q = 6A$

$Q = \rho V$.

$$\boxed{E = \frac{\lambda}{2\pi\varepsilon_0 z}}.$$

$E \oint ds = E(S)$

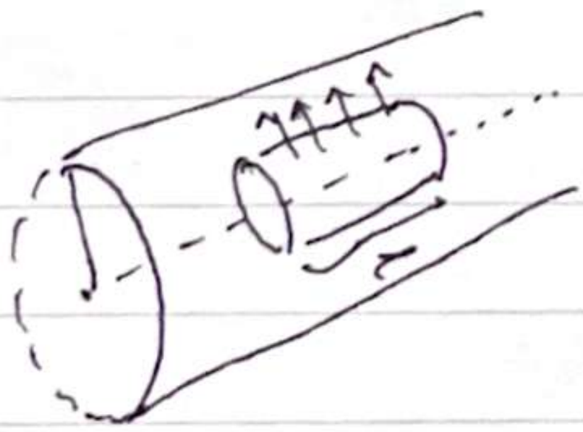
$\oint \vec{E}\, d\vec{s} = \frac{Q}{\varepsilon_0}$.

$E.S = \frac{\lambda l}{\varepsilon_0}$.

$E.2\pi z \cancel{K} = \frac{\lambda \cancel{K}}{\varepsilon_0}$.

$E = \frac{\lambda}{2\pi\varepsilon_0 z}$.

2) Sebuah silinder pejal panjang setali, dengan jari-jari silinder R, rapat muatan q. hitung medan listrik di dalam silinder !



$\oint_s E\, ds = \frac{Q}{\varepsilon_0}$ → $\rho\, dz$.

$= \frac{1}{\varepsilon_0} \iiint \rho\, dv$

$= \frac{\rho}{\varepsilon_0} \int_0^l \int_0^r \int_0^{2\pi} r\, d\phi\, dr\, dz$

$= \frac{2\pi\rho}{\varepsilon_0} \int_0^l \int_0^r r\, dr\, dz$

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Lanjutan no 2.

$= \frac{2\pi \rho l}{\varepsilon_0} \int_0^r r\,dr$.

$= \frac{2\pi \rho l}{\varepsilon_0} \left[\frac{1}{2} r^2 \Big|_0^r \right]$.

G . S .

$E \not(2\pi r l) = \frac{2\pi \rho l}{2\varepsilon_0} \left[r^2 - 0 \right]$.

$E \ (2\pi r l) = \frac{\pi \rho l r^2}{\varepsilon_0}$.

$E = \frac{\rho r^2}{2r\varepsilon_0} = \frac{\rho r}{2\varepsilon_0}$.

jadi, medan listrik di dalam silinder dengan jari-jari r bergantung pada rapat dan tempatnya.