UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERÍA
ESCUELA DE CIENCIAS
DEPARTAMENTO DE FÍSICA

Curso:	Nota:
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AUX. CÉSAR FERNÁNDEZ	

TAREA ■
HOJA DE TRABAJO ☐
EXAMEN CORTO ☐

No. 3

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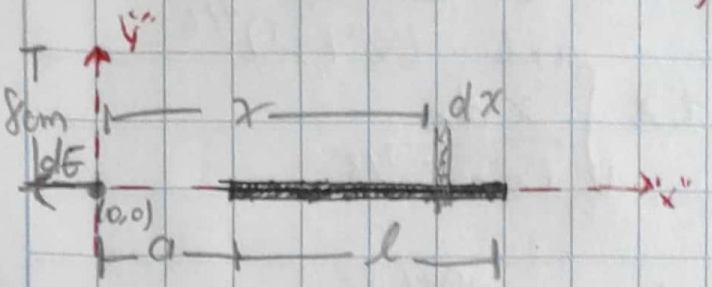
Problema 4:

a) $\lambda = 2.5 \times 10^{-9}\ C/m$

$a = 0.05\ m$

$l = 0.20\ m$



$$\lambda = \frac{q}{l} \rightarrow q = \lambda l \quad (1)$$

$$\int dE = \int \frac{k\, dq}{r^2} \qquad r^2 = x^2 \qquad dq = \lambda dl \qquad dq = \lambda dx$$

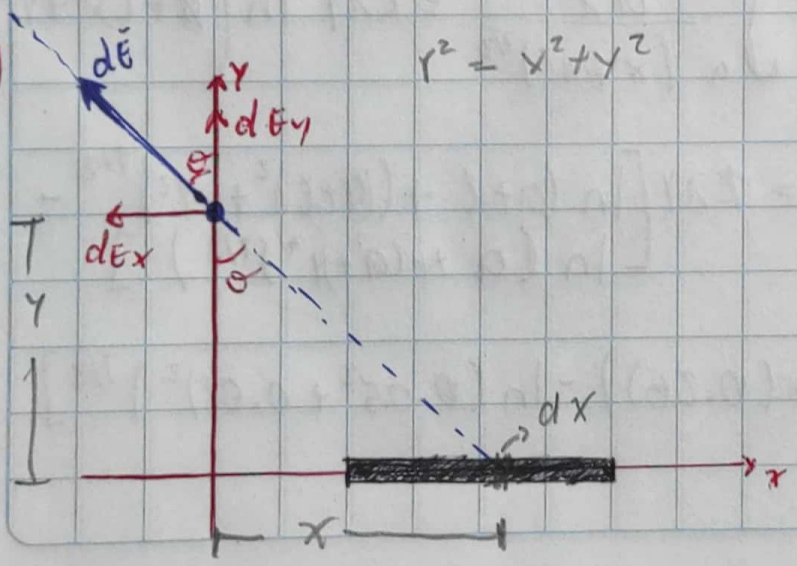
$$E = k\int_a^{a+l} \frac{\lambda dx}{x^2} = k\lambda \int \frac{dx}{x^2} = -k\lambda \frac{1}{x}$$

$$E = k\lambda \left[-\frac{1}{x}\right]_a^{a+l} = k\lambda\left(-\frac{1}{a+l} - \left(-\frac{1}{a}\right)\right)$$

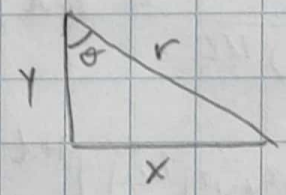
$$E = k\lambda\left(-\frac{1}{a+l} + \frac{1}{a}\right) = k\lambda\left(\frac{l}{a(a+l)}\right) = \frac{k(2.5\times10^{-9})(0.20)}{(0.05)(0.05+0.20)}$$

$E = 360\ N/C\ (-\hat{i})$ $\quad E = 360\ N/C\ (-\hat{i})$

b)



$$r^2 = x^2 + y^2$$



$$\cos\theta = \frac{y}{(x^2+y^2)^{1/2}}$$

$$dq = \lambda dx$$

$$E = \int \frac{k\lambda\, dx}{x^2+y^2}$$

a) $E_x = ?$ $\quad dE_x = dE \operatorname{Sen}\theta$ $\quad \operatorname{Sen}\theta = \dfrac{x}{(x^2+y^2)^{1/2}}$

$$E_x = k\lambda \int \frac{dx}{(x^2+y^2)} \frac{x}{(x^2+y^2)^{1/2}} = k\lambda \int_a^{a+L} \frac{x\,dx}{(x^2+y^2)^{3/2}}$$

$$E_x = k\lambda \int_a^{a+L} \frac{x}{(x^2+y^2)^{3/2}} dx = k\lambda \left(\frac{-1}{(x^2+y^2)^{1/2}} \Big|_a^{a+L} \right)$$

$$E_x = k\lambda \left[\frac{-1}{((a+L)^2+y^2)^{1/2}} - \left(\frac{-1}{(a^2+y^2)^{1/2}} \right) \right] =$$

$$E_x = k(2.5\times10^{-9}) \left(\frac{-1}{(0.05+0.2)^2+(0.08)^2)^{1/2}} + \frac{1}{((0.05)^2+(0.08)^2)^{1/2}} \right)$$

$E_x = 152.78$ N/C $(+\hat{i})$

$E_x = -152.78$ N/C

$E_y = 118.8$ N/C

$dE_y = dE\cos\theta \qquad \cos\theta = \dfrac{y}{(x^2+y^2)^{1/2}}$

$$E_y = k\lambda \int \frac{y\,dx}{(x^2+y^2)^{1/2}} = k\lambda y \int_a^{a+L} \frac{dx}{(x^2+y^2)^{1/2}} = k\lambda y \ln\left(x + (x^2+y^2)^{1/2} \right)$$

$$E_y = k\lambda y \ln\left(x + (x^2+y^2)^{1/2} \right) \Big|_a^{a+L} = k\lambda y \left[\ln\left(a+L + ((a+L)^2+y^2)^{1/2}\right) - \ln\left(a + (a^2+y^2)^{1/2}\right) \right]$$

$$E_y = k(2.5\times10^{-9})(0.08) \left[\ln(0.25+(0.26)) - \ln(0.05^2+0.08)^2)^{1/2} \right]$$

$E_y = 118.8$ m.