	UNIVERSIDAD DE SAN CARLOS DE GUATEMALA	**FÍSICA 2 C**	NOTA:
	FACULTAD DE INGENIERÍA		
	ESCUELA DE CIENCIAS	**1S2023**	
	DEPARTAMENTO DE FÍSICA		
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HT 1

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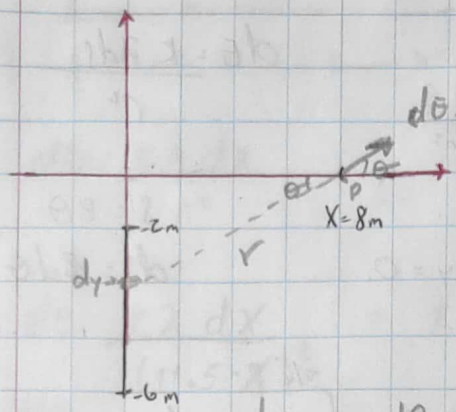
Problema 1



$q = 24\ nC$

$dq = \lambda dy$

$\lambda = \frac{dq}{dl} = \frac{q}{l} = \frac{24}{4}$

$\lambda = 6\ nC/m$

$r = \sqrt{y^2 + 8^2}$

$\text{Sen}\theta = \frac{-y}{r}$

$dE = \frac{K dq}{r^2} \Rightarrow dE_y = dE\ \text{Sen}\theta$

$$E_y = \int \frac{K\lambda\, dy}{r^2} = K\lambda \int \frac{dy}{(y^2+8^2)^2}\,\text{Sen}\theta = -K\lambda \int_{-6}^{-2} \frac{y\,dy}{(y^2+8^2)^{3/2}}$$

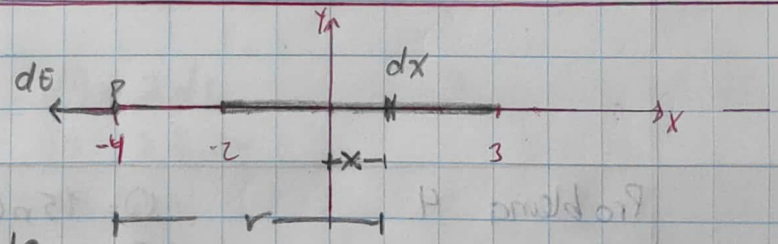
$$E_y = -K\lambda \int_{-6}^{-2} \frac{y\,dy}{(y^2+8^2)^{3/2}} \qquad u = y^2+8^2 \qquad du = 2y\,dy \Rightarrow \int \frac{du}{2u^{3/2}} = -\frac{1}{u^{1/2}}$$

$$E_y = -K\lambda \left[\frac{-1}{(y^2+64)^{1/2}} \Big|_{-6}^{-2} \right] = K\lambda \left[\frac{1}{(4+64)^{1/2}} - \frac{1}{10} \right] = 1.15\ N/C$$

$E_y = 1.15\ N/C$

Problema 2:

$\lambda = 4\ nC/m$



$dE = \frac{K dq}{r^2}$ $\qquad dx = \frac{dq}{\lambda}$

$r = 4 + x$ $\qquad dq = \lambda dx$ $\qquad \Rightarrow dE_x = \frac{K\lambda dx}{(4+x)^2}$

$$E_x = K\lambda \int_{-2}^{3} \frac{dx}{(4+x)^2} = -K\lambda \left[\frac{1}{4+x} \Big|_{-2}^{3} \right]$$

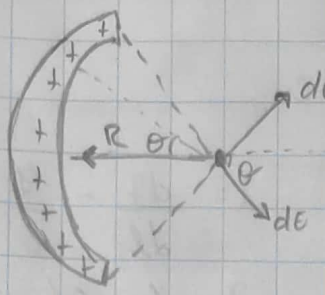
$$E_x = -K\lambda \left[\frac{1}{4+3} - \frac{1}{4-2} \right] = -K\lambda \left[\frac{1}{7} - \frac{1}{2} \right] = 12.9\ N/C\ (-\hat{i})$$

$E_x = 12.9\ N/C\ (-\hat{i})$

Problema 3: $q = +10\,mC$

$R = 0.15\,m$

a)



$r = R$

$dq = \lambda ds$

$dE = \frac{K dq}{r^2}$

$dE = \frac{K \lambda ds}{r^2}$

$s = R\theta$

$ds = R d\theta$

$dE = \frac{K \lambda R d\theta}{R^2} = \frac{K \lambda d\theta}{R}$ $\quad E_y = 0$

$$E = E_x = 2\int_0^{\pi/4} dE_x \cos\theta = \frac{2K\lambda}{R}\int_0^{\pi/4} \cos\theta\, d\theta = \frac{2K\lambda}{R}\sin\theta\Big|_0^{\pi/4}$$

$$E = \frac{2K\lambda}{R}\left[\sin\pi/4 - \sin 0^\circ\right] = \frac{2K\,q/\pi/2}{R}\sin\frac{\pi}{4}$$

$$E = \frac{2K(10\times10^{-3})}{\frac{\pi R}{2}}\sin\pi/4 = 3.6\times10^{9}\ N/C$$

$E = 3.6\times10^{9}\ N/C$

b) $F = 0.1\,N$

$$E = \frac{F}{q} \Rightarrow q = \frac{F}{E} = \frac{0.1}{3.6\times10^{9}} = 27.78\times10^{-12}$$

$q = 27.78\times10^{-12}\ C$

Problema 4.

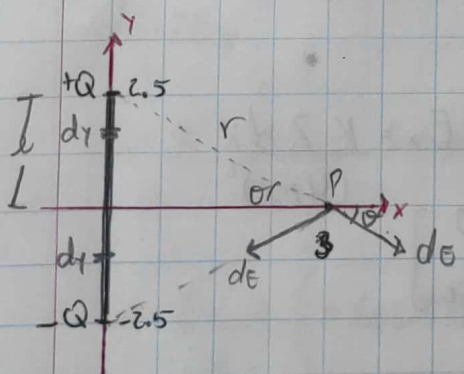
$Q = 15\,nC$

$E_x = 0$

$E_y = (-j)$

$dE = \frac{K dq}{r}$ $\quad dq = \lambda dy$

$dE = \frac{K\lambda dy}{r^2} = \frac{K\lambda dy}{(y^2+9)}$



$r = (y^2+3^2)^{1/2}$

$\lambda = \frac{Q}{\ell} = \frac{15n}{2.5} = 6nC/m$

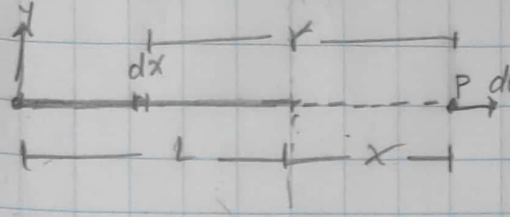
$\sin\theta = \frac{y}{(y^2+9)^{1/2}}$

$$dE_y = dE\sin\theta = \frac{K\lambda dy}{(y^2+9)}\sin\theta = \frac{K\lambda dy}{y^2+9}\left(\frac{y}{(y^2+9)^{1/2}}\right) = 2\int_0^{2.5}\frac{K\lambda\, y\, dy}{(y^2+9)^{3/2}}$$

$$E = 2K\lambda\int_0^{2.5}\frac{y\,dy}{(y^2+9)^{3/2}} = 108\int_0^{2.5}\frac{y\,dy}{(y^2+9)^{3/2}}$$

$$E = 108\int_0^{2.5}\frac{y\,dy}{(y^2+9)^{3/2}}$$

Problema 5:



$q = 8nC$ $\quad \lambda = \frac{q}{L} = \frac{8n}{10}$

$L = 10m$ $\quad \lambda = 0.8\ nC/m$

$x = 1.50$

a)

$dq = \lambda dx$

$r = 11.5 - x$

$$dE = \frac{k\lambda\, dx}{r^2}$$

$$dE = \frac{k\lambda\, dx}{(11.5-x)^2} = k\lambda \int_0^{10} \frac{dx}{(11.5-x)^2} =$$

$u = 11.5 - x$

$du = -dx$

$-du = dx$

$$E = -k\lambda \int \frac{du}{u^2} = -k\lambda \left[\frac{-1}{(11.5-x)} \Big|_0^{10} \right] = k\lambda \left(\frac{-1}{1.5} + \frac{1}{11.5} \right)$$

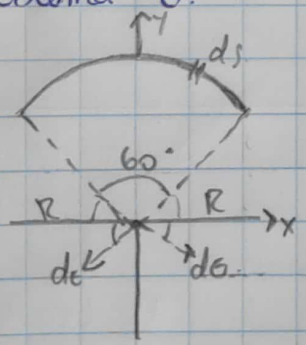
$E = 4.17\ N/C$

$\boxed{E = 4.17\ N/C}$

b) $F = 0.8\ N$ $\quad q = \frac{F}{E} = \frac{0.8}{4.17} = 0.1918\ C \cong 191.8\ mC$

$\boxed{F = 192\ mC}$

Problema 6:



$q = 0.471nC$

$\theta = 60° = \pi/3$ $\quad E_x = 0$

$R = 18.cm = 0.18m$ $\quad E_y = -\hat{j}$

$dq = \lambda ds$ $\quad \lambda = \frac{0.471}{0.18\,\theta} = 2.50$

$dq = \lambda R d\theta$

$r = R$

$dE = 2E_y$

$$E_y = \frac{k\lambda R d\theta}{R^2} \operatorname{sen}\theta = \frac{2k\lambda}{R} \int_{\pi/3}^{\pi/2} \operatorname{sen}\theta\, d\theta = \frac{2k\lambda}{R} \left[-\cos\theta \Big|_{\pi/3}^{\pi/2} \right]$$

$$E_y = \frac{2k\lambda}{R} \left(-\cos\pi/2^{\circ} + \cos\pi/3 \right) = \frac{2k\lambda}{R} \left(\frac{1}{2} \right) = 125\ N/C$$

$\boxed{E = 125\ N/C}$