UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERÍA
ESCUELA DE CIENCIAS
DEPARTAMENTO DE FÍSICA
FISICA 2
INGA. CLAUDIA CONTRERAS

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|---|---|---|---|---|
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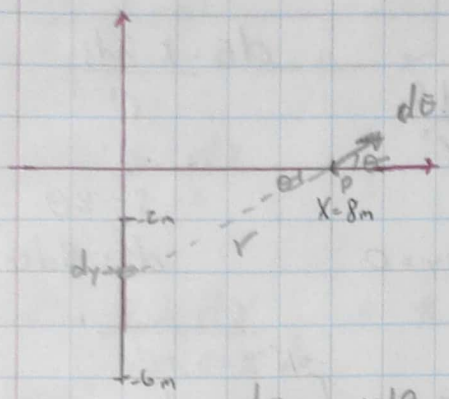
# HT 1

## Problema 1




$q = 24\ nC$

$dq = \lambda dy$

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

$\lambda = 6\ nC/m$

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

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

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

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

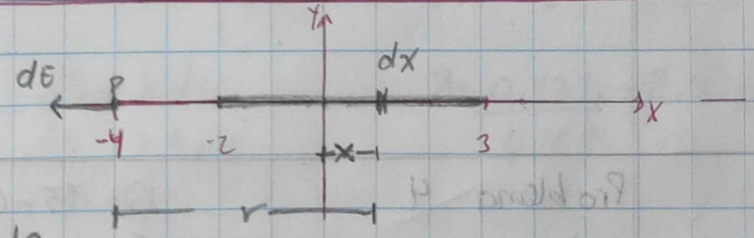
$E_y = -K\lambda \int_{-6}^{-2} \frac{y\,dy}{(y^2+8^2)^{3/2}}$ $\quad u = y^2+8^2$ $\quad du = 2y\,dy$ $\Rightarrow \int \frac{du}{2u^{3/2}} = \frac{-1}{u^{1/2}}$

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

$E_y = 1.15\ N/C$

## Problema 2:

$\lambda = 4\ nC/m$




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

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

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

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

$E_x = -13\ N/C\ (\hat{\imath})$

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

## Problema 3:

$s = R\theta \Rightarrow R = s/\theta$ $\quad ds = R\,d\theta$ $\quad dq = \lambda\, ds$ $\quad dq = \lambda R\, d\theta$

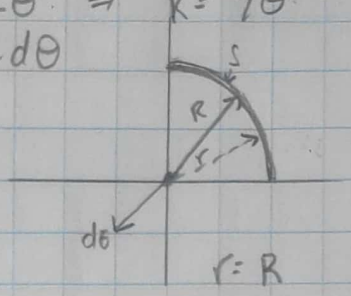
$\lambda = 8.00\ nC/m$

$s = 3.50\ m$

$R = \frac{3.5}{\pi/2}$

$R = 7/\pi$

$dE = \frac{K\,dq}{r^2} = \frac{K\lambda R\, d\theta}{R^2}$




$dE_x = \frac{K\lambda\, d\theta}{R}\,\text{Sen}\theta$ $\quad dE_y = \frac{K\lambda\, d\theta}{R}\cos\theta$

$E_x = \frac{K\lambda}{R}\int_0^{\pi/2} \text{Sen}\theta\, d\theta = \frac{K(8n)}{7/\pi}\left[-\cos\theta\,|_0^{\pi/2}\right] = \frac{K(8n)(0-(-\cos 0))}{7/\pi}$

$E_x = 32.31\ N/C$

$E_y = \frac{K\lambda}{R}\int_0^{\pi/2} \cos\theta\, d\theta = \frac{K(8n)}{7/\pi}\left[\text{Sen}\theta\,|_0^{\pi/2}\right] = \frac{K(8n)}{7/\pi}(1) = 32.31\ N/C$

$|E| = \sqrt{(32.31)^2 + (32.31)^2} = 45.69\ N/C$

$|E| = 45.7\ N/C$

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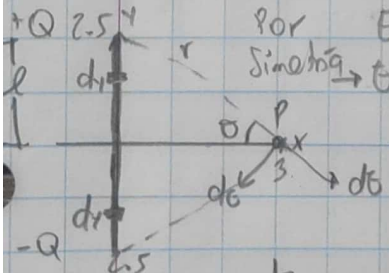
## Problema 4:

$Q = 15nC$ $\quad r = (y^2+3^2)^{1/2}$ $\quad \text{Sen}\theta = \frac{y}{(y^2+9)^{1/2}}$

Por Simetría $\rightarrow E_x = 0$ $\quad \lambda = \frac{15n}{2.5m} = 6nC/m$




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

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

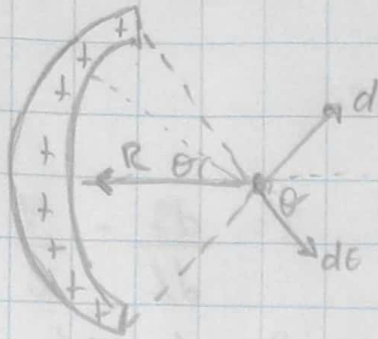
$E_y = 2K\lambda\int_0^{2.5} \frac{y\,dy}{(y^2+9)^{3/2}} = 108\int_0^{2.5} \frac{y\,dy}{(y^2+9)^{3/2}}$

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

Problema 5: $q = +10\,mC$

$R = 0.15\,m$

a)




$r = R$

$dq = \lambda ds$

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

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

$s = R\theta$

$ds = R d\theta$

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

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

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

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

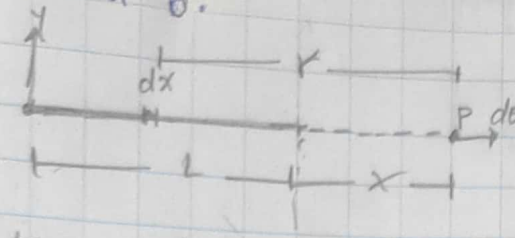
$E = 3.6*10^9\ N/C$

b) $F = 0.1\,N$

$E = \frac{F}{q} \Rightarrow q = \frac{F}{E} = \frac{0.1}{3.6*10^9} = 27.78*10^{-12}$

$q = 27.78*10^{-12}\ C$

Problema 6:




a)

$q = 8nC$ $\quad L = 10m$ $\quad x = 1.50$

$\lambda = \frac{q}{L} = \frac{8n}{10}$ $\quad \lambda = 0.8\ nC/m$

$dq = \lambda dx$

$r = 11.5 - x$

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

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

$u = 11.5 - x$

$du = -dx$

$-du = dx$

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

$E = 4.17\ N/C$

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

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

$\boxed{F = 192\ mC}$

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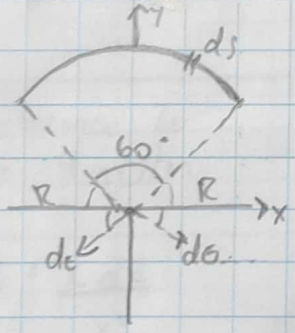
Problema 7:




$q = 0.471nC$

$\theta = 60° = \pi/3$

$R = 18.cm = 0.18m$

$E_x = 0$

$E_y = -\hat{j}$

$dq = \lambda ds$

$dq = \lambda R d\theta$

$r = R$

$\lambda = \frac{0.471}{0.18\,\theta}$

$dE = 2E_y$

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

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

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