UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERÍA
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DEPARTAMENTO DE FÍSICA
ING. OSCAR TECUN

Física 2 P	Nota:
Junio 2022	
AUX. ANDREA GARCIA	

TAREA ☐
HOJA DE TRABAJO ■
EXAMEN CORTO ☐

No. 2

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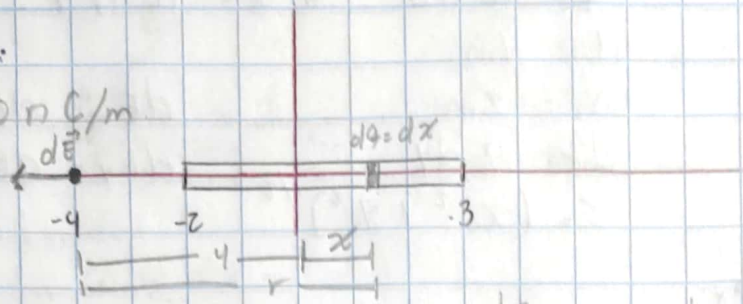
HTC

Problema 1:

$\lambda = +4.0\ nC/m$



$r = 4 + x$

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

$dq = \lambda\,d\ell$

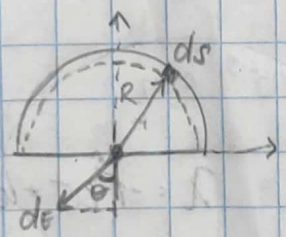
$dq = \lambda\,dx$ $\qquad \int dE = \int_{-2}^{3} \frac{K\,\lambda\,dx}{(4+x)^2}$

$$E = (9\times10^9)(4\text{n})\int_{-2}^{3} \frac{dx}{(4+x)^2} = -36\left(\frac{1}{4+x}\right)\Big|_{-2}^{3}$$

$$E = -36\left[\left(\frac{1}{4+3}\right) - \left(\frac{1}{4-2}\right)\right] = -36\left(\frac{1}{7} - \frac{1}{2}\right) = -36\left(\frac{-5}{14}\right) = \frac{90}{7}\ \frac{N}{C}$$

$$E = -12.9\ \frac{N}{C}\ (\hat{\imath})$$

Problema 2:



$\ell = 2m$

$Q = 3.0\ nC/m$

$r = R$

$\theta = \pi$

$\lambda = \frac{3\times10^{-9}}{2} = 1.5\times10^{-9}$

$s = R\theta$

$ds = R\,d\theta$ $\qquad \frac{2}{\pi} = R$

$dq = \lambda\,R\,d\theta$

$d\vec{E}_x = \frac{K\,\lambda\,R\,d\theta}{R^2}\,\sin\theta$ → Por simetría $E_x = 0$

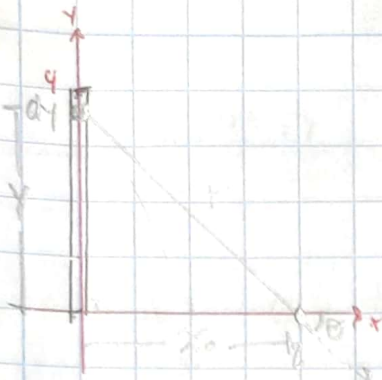
$$d\vec{E}_y = \frac{K\,\lambda\,d\theta\,\cos\theta}{R} = 2\int_0^{\pi/2} \frac{K\lambda}{R}\cos\theta\,d\theta = \frac{2K\lambda}{R}\int_0^{\pi/2}\cos\theta\,d\theta =$$

$$\vec{E}_y = \vec{E} = \frac{2(9\times10^9)(1.5\times10^{-9})}{2/\pi}(\sin\theta)\Big|_0^{\pi/2} = 27\pi\left[\sin\frac{\pi}{2} - \sin 0^\circ\right]$$

$\vec{E} = 27\pi = 84.8\ N/C$

$\vec{E} = 85\ N/C$

Problema 3:



$q = 12\,nC \Rightarrow \lambda = 12n/4 = 3\times10^{-9}\ C$

$L = 4m$

$x_0 = 2m$

$dq = \lambda\, dy$

$r = (x_0^2 + y^2)^{1/2}$

$dE_x = dE\cos\theta$

$dE_y = dE\sin\theta$

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

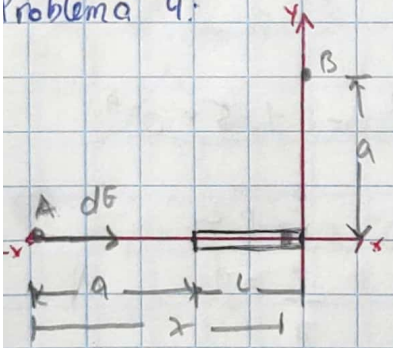
$$\cos\theta = \frac{x_0}{r} = \frac{x_0}{(x_0^2+y^2)^{1/2}}$$

$$\vec{E}_x = \int_0^4 \frac{k\lambda\, dy}{r^2}\left(\frac{x_0}{(x_0^2+y^2)^{1/2}}\right) = \int_0^4 \frac{k\lambda x_0\, dy}{(x_0^2+y^2)^{3/2}} =$$

$$\vec{E}_x = \int_0^4 \frac{(9\times10^9)(3\times10^{-9})(2)}{(x_0^2+y^2)^{3/2}}\, dy = \int_0^4 \frac{54}{(4+y^2)^{3/2}}\, dy$$

$$\vec{E}_x = \int_0^4 \frac{54}{(4+y^2)^{3/2}}\, dy$$

Problema 4:



$L = 0.1\,m$

$q = -125\,\mu C$

$a = 0.1\,m$

$r = a + L - x$

$r = 0.2 - x$

$dq = \lambda\, dx$

a) $\lambda = \frac{q}{L} = \frac{-125\times10^{-6}}{0.1} =$

$\lambda = -1.25\times10^{-3}\ C/m$

$\lambda = -1.25\times10^{-3}\ C/m$

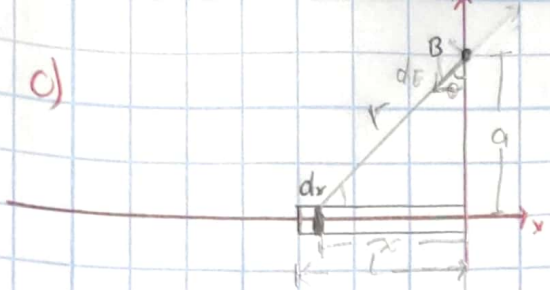
b) $$dE = \frac{k\lambda\, dx}{r^2} = k\lambda\int_{-0.1}^{0}\frac{dx}{(0.2-x)^2} = (9n)(1.25m)\left(\frac{-1}{(-0.2-x)}\right)\Big|_{-0.1}^{0}$$

$$11.25\times10^6\left[\frac{1}{-0.2-0} - \frac{1}{-0.2+0.1}\right] = 11.25\times10^6\left(-5+10\right) = 11.25\times10^6\,(5)$$

$\vec{E}_A = 56250000\ N/C\ (\hat{i})$

$\vec{E}_A = 56250\ KN/C\ (\hat{i})$

c)



$L = 0.1\,m$

$a = 0.1\,m$

$\lambda = -1.25 \times 10^{-3}\ C/m$

$dq = \lambda\, dx$

$r = (-x_0^2 + a)^{1/2}$

$dE_y = dE \operatorname{sen}\theta$

$dE_y = \dfrac{K \lambda dx \cos\theta}{r^2}$

$\cos\theta = \dfrac{-x_0}{(-x)^2 + a^2)^{1/2}}$

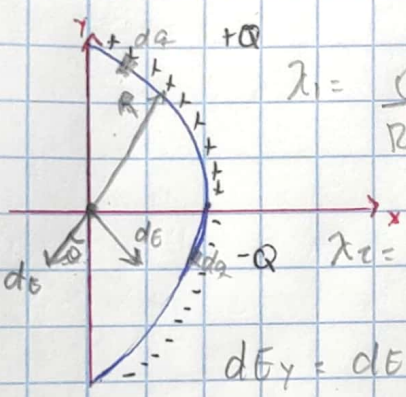
$$E_y = K\lambda \int_{x_{0.1}}^{0} \frac{\cos\theta\, dx}{r^2} =$$

$$E_y = K\lambda \int_{-0.1}^{0} \frac{-x}{(-x)^2 + a^2)^{3/2}}\, dx = -\int_{-0.1}^{0} \frac{(9\,n)(-1.25\,m)(-0.1)}{(-x^2 + a^2)^{3/2}}\, dx$$

$$E_y = \int_{-0.1}^{0} \frac{1.125 \times 10^6\, dx}{(-x^2 + a^2)^{3/2}}$$

$$\vec{E}_y = \int_{-0.1}^{0} \frac{1.125 \times 10^6\, dx}{(-x^2 + 0.01)^{3/2}}\ (-\hat{j})$$

Problema 5:



$dE_x = 0 \Rightarrow$ Por simetría.

$\lambda_1 = \dfrac{Q}{R\theta}$

$|\lambda_1| = |\lambda_2| = |\lambda|$

$dq = |\lambda| R d\theta$

$\lambda_2 = \dfrac{-Q}{R\theta}$

$dE = \dfrac{K \lambda R d\theta}{R^2} = \dfrac{K \lambda\, d\theta \cos\theta}{R}$

$dE_y = dE \cos\theta$

$$E_y = 2\int_0^{\pi/2} \frac{K\lambda \cos\theta}{R}\, d\theta = \frac{2K\lambda}{R}\left(-\operatorname{Sen}\theta\right)\Big|_0^{\pi/2} = 2\frac{K\lambda}{R}$$

$$\lambda = \frac{Q}{R\theta} = \frac{Q}{R\pi/2} = \frac{2Q}{R\pi} \Rightarrow \frac{2K}{R}\left(\frac{2Q}{R\pi}\right) = \frac{4KQ}{R^2\pi}\ (-\hat{j})$$

$$\vec{E} = \frac{4KQ}{R^2\pi}\ (-\hat{j})$$