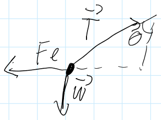
Preparcial 3 parte teórica

miércoles, 8 de noviembre de 2023 8:43 a. m.

21. *Calculo de raíces en física:* Cuatro esferas de pesos iguales $w = 114.6\ N$ y cargas iguales $q = 3\times 10^{-4}\ C$ se encuentran en los extremos de hilos inelásticos y aislantes de longitudes $L = 5\ m$. Los que a su vez se encuentran unidos en $O$. Para la aplicación numérica use $g = 10\ m/s^2$ (Tomado de [5]).




$$Fe = k\frac{q^2}{(2\sin\theta\cdot L)^2} + k\frac{q^2}{(\sqrt{2}\sin\theta L)^2} + \frac{kq^2}{(\sqrt{2}\sin\theta\cdot L)^2}$$

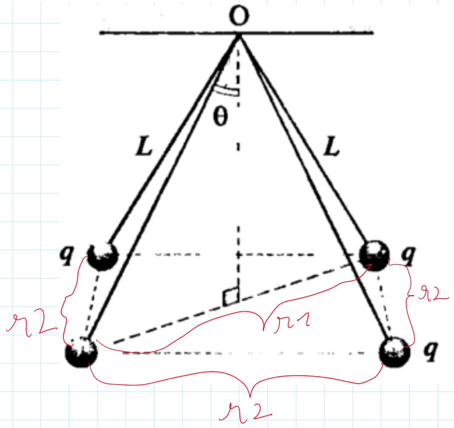
$$= \frac{k\,q^2}{4\sin^2\theta\cdot L^2} + \frac{\cancel{2}kq^2}{\cancel{2}\sin^2\theta\cdot L^2}$$

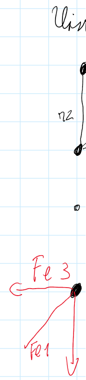
$$= \frac{kq^2}{\sin^2\theta\cdot L^2}\left(\frac{1}{4}+1\right) = \frac{5}{4}\,\frac{kq^2}{\sin^2\theta\cdot L^2}$$

$r1/2 = \sin\theta\cdot L$

$r1 = 2\sin\theta\cdot L$

$r2 = \sqrt{2}\sin\theta\cdot L$




Eje y: $W = \|T\|\cdot\cos\theta$

$$\|T\| = \frac{W}{\cos\theta}$$

Eje x: $Fe = \|T\|\sin\theta$

$$Fe = \frac{W\sin\theta}{\cos\theta}$$

Nos quedamos con esta expresión:

$$\frac{\sin^3\theta}{\cos\theta} = \frac{5}{4}\,\frac{kq^2}{WL^2}$$

$$\frac{5}{4}\,\frac{kq^2}{\sin^2\theta\cdot L^2} = \frac{W\sin\theta}{\cos\theta}$$

$$\frac{\cos\theta}{\sin^3\theta} = \frac{4}{5}\,\frac{W\cdot L^2}{kq^2}$$

$$\frac{\sin^3\theta}{\cos\theta} = \frac{5}{4}\,\frac{kq^2}{WL^2}$$

$$\left(\frac{\sin^3\theta}{\cos\theta} = \frac{5}{4}\,\frac{kq^2}{WL^2}\right)^2$$

$$\frac{\sin^6\theta}{\cos^2\theta} = \frac{25}{16}\,\frac{k^2q^4}{W^2L^4} = \alpha$$

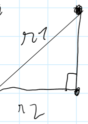
$$\sin^6\theta = \alpha\cos^2\theta$$

$$\sin^6\theta = \alpha(1-\sin^2\theta)$$

$$\sin^6\theta = \alpha - \alpha\sin^2\theta$$

$$\boxed{\sin^6\theta + \alpha\sin^2\theta - \alpha = 0}$$

ta de arriba




$$r2^2 + r2^2 = r1^2$$

$$r2^2 = \frac{(2\sin\theta\cdot L)^2}{2}$$

$$r2^2 = \frac{2^{\cancel{2}}\sin^2\theta\cdot L^2}{\cancel{2}} = 2\sin^2\theta\cdot L^2$$

$$r2 = \sqrt{2\cdot\sin^2\theta\cdot L^2}$$

$$r2 = \sqrt{2}\cdot\sin\theta\cdot L$$

$\Rightarrow$

$F_{E2}$

$\vec{E}_{TOTAL}$