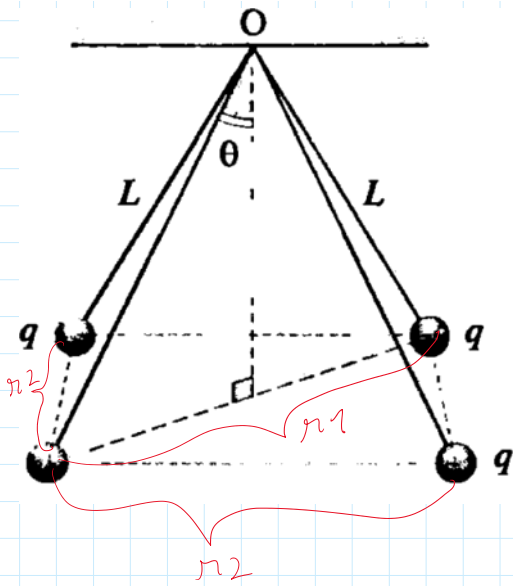
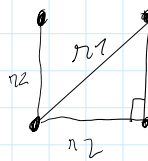


21. *Calculo de raíces en física:* Cuatro esferas de pesos iguales $w = 114.6 \text{ N}$ y cargas iguales $q = 3 \times 10^{-4} \text{ C}$ se encuentran en los extremos de hilos inelásticos y aislantes de longitudes $L = 5 \text{ m}$. Los que a su vez se encuentran unidos en O . Para la aplicación numérica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



Visita de arista



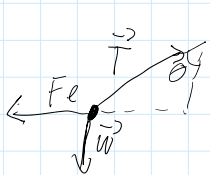
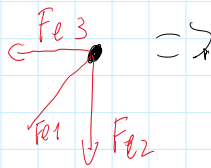
$$r_2^2 + r_1^2 = L^2$$

$$r_2^2 = \left(\frac{2 \sin \theta \cdot L}{2} \right)^2$$

$$r_2^2 = \frac{L^2 \sin^2 \theta \cdot 2}{2} = 2 \sin^2 \theta \cdot L^2$$

$$r_2 = \sqrt{2 \sin^2 \theta \cdot L^2}$$

$$r_2 = \sqrt{2} \cdot \sin \theta \cdot L$$



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

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

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

$$r_1/2 = \sin \theta \cdot L$$

$$r_1 = 2 \sin \theta \cdot L$$

$$r_2 = \sqrt{2} \sin \theta \cdot L$$

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

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

Ej x: $F_e = \|T\| \sin \theta$

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

Nos quedamos con esta expresión:

$$\frac{\sin^3 \theta}{\cos \theta} = \frac{5}{4} \frac{k q^2}{W L^2}$$

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

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

$$\frac{\sin^3 \theta}{\cos \theta} = \frac{5}{4} \frac{k q^2}{W L^2}$$

$$\left(\frac{\sin^3 \theta}{\cos \theta} = \frac{5}{4} \frac{k q^2}{W L^2} \right)^2$$

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

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

$$\frac{\sin^3 \theta}{\cos \theta} = \frac{5}{4} \frac{k q^2}{W L^2}$$

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

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

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

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