

نقطه کانونی - 2120 میله

زاویه  $\varphi$

$$\omega = \frac{d\varphi}{dt}$$

$$\alpha = \frac{d\omega}{dt}$$

$$I = \sum m_i r_i^2 = \int r^2 dm$$

$$\sum \tau = I \alpha$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

$$\vec{\tau} = \vec{r} \times \vec{F} \quad [N \cdot m]$$

$$\sum \vec{\tau} = 0 \Rightarrow \vec{\alpha} = 0$$

(معمولاً) (مع) جمله مع

$$I = I_{cm} + mL^2$$

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زاویه -  $I_{cm}$   
طول -  $L$

نقطه کانونی

x

$$v = \frac{dx}{dt}$$

$$a = \frac{dv}{dt}$$

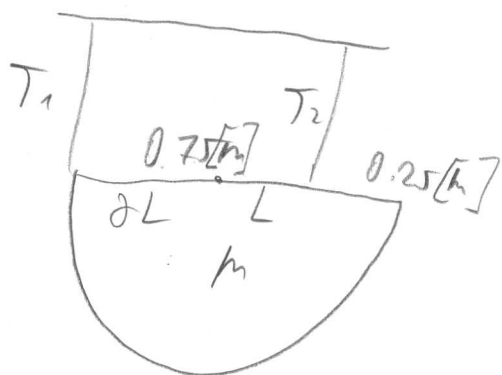
m

$$\sum F = ma$$

F

نقطه کانونی

طول



$$\sum F_y = 0$$

$$T_1 + T_2 = mg$$

I

$$\sum \tau = 0$$

$$L T_2 \sin 90^\circ - 2L T_1 \sin 90^\circ = 0$$

II

$$T_2 = 2T_1$$

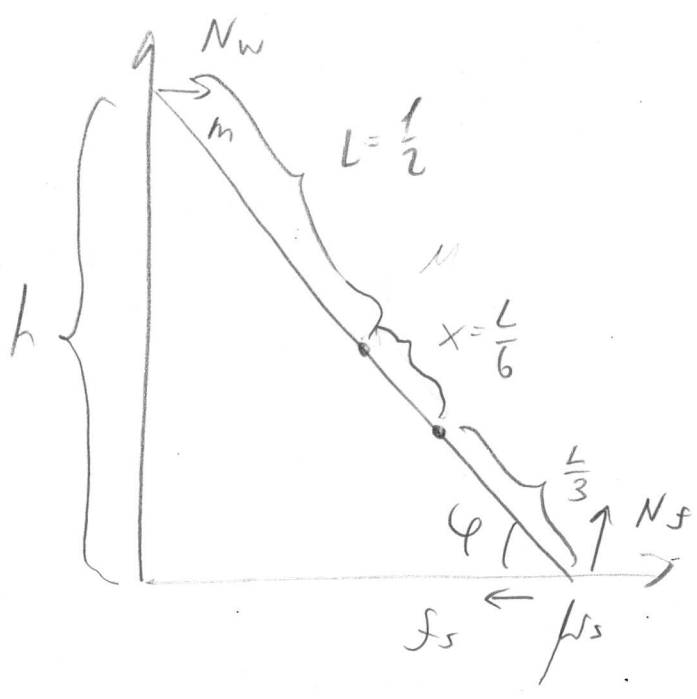
II ✓

$$3T_1 = mg$$

I ✓

$$T_1 = \frac{mg}{3}$$

$$T_2 = \frac{2mg}{3}$$



$$\sin \phi = \frac{h}{L}$$

$$\cos \phi = \frac{\sqrt{L^2 - h^2}}{L}$$

$$\Sigma \vec{F} = 0 \quad \text{---} \text{ pulled}$$

$$\Sigma F_y = 0 \Rightarrow N_f - mg - Mg = 0 \Rightarrow N_f = (m+M)g$$

$$\Sigma F_x = N_w - f_s = 0, \quad f_s \leq N_f \cdot \mu_s$$

--- corner

$$\Sigma \tau_z = 0 = -f_s \cdot \frac{L}{3} \cdot \sin \phi + N_w \cdot \frac{2L}{3} \cdot \sin \phi + N_f \cdot \frac{L}{3} \cdot \sin(90-\phi) + mg \cdot \frac{L}{6} \cdot \sin(90-\phi)$$

$$N_w \cdot \frac{2L}{3} \sin \phi - \left( \frac{m+M}{3} + \frac{M}{6} \right) L \cos \phi = 0$$

$$N_w = \left( \frac{m+M}{3} + \frac{M}{6} \right) g \cdot \frac{\sqrt{L^2 - h^2}}{L} \cdot \frac{L}{h} = \left( \frac{m}{3} + \frac{M}{2} \right) g \cdot \frac{\sqrt{L^2 - h^2}}{h}$$

$$f_{s \max} = N_f \cdot \mu_s$$

$$N_w = N_f \cdot \mu_s = (m+m)g \cdot \mu_s = f_s$$

$$\sum \tau_x = 0$$

$$-f_s \cdot \frac{L}{3} \cdot \sin \varphi - N_w \cdot \frac{2L}{3} \sin \varphi + N_f \cdot \frac{L}{3} \cdot \cos \varphi + mgx \cos \varphi = 0$$

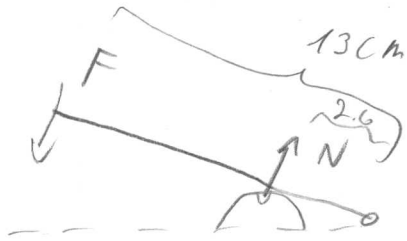
$$N_f \mu_s \frac{L}{3} \sin \varphi + N_f \mu_s \cdot \frac{2L}{3} \sin \varphi - N_f \cdot \frac{L}{3} \cos \varphi - mgx \cos \varphi = 0$$

$$N_f L (\mu_s \sin \varphi - \cos \varphi) = mgx \cos \varphi$$

$$x_{\max} = \frac{N_f \cdot L (\mu_s \sin \varphi - \cos \varphi)}{mg \cos \varphi}$$

$$x_{\max} = \frac{(m+m)g \cdot L (\mu_s \sin \varphi - \frac{1}{3})}{mg}$$

$$x_{\max} = L \cdot \left( \frac{m+m}{m} \right) \cdot \left( \mu_s \cdot \frac{\sqrt{L^2 - h^2}}{L} - \frac{1}{3} \right)$$



2

$$\sum \tau = 0, \quad N = 46 \text{ [N]}$$

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$$N \cdot 2.6 \text{ [cm]} \cdot \sin 90 - F \cdot 13 \text{ [cm]} \cdot \sin 90 = 0$$

$$F = N \cdot \frac{2.6}{13} = 46 \text{ [N]} \cdot \frac{2.6}{13} = 9.2 \text{ [N]} \leq 46 \text{ [N]}$$