שאלות אמריקאיות

1. $\int_0^{t_f} F\,dt = mV_f - mV_i$

$V_f = 0$

$-\frac{k t_f^2}{2} = -mV_0$

$t_1 = \sqrt{\frac{2mV_0}{k}}$

ד

2. $F\cos\theta = \mu_s(mg \pm F\sin\theta)$

$F = \frac{\mu_s mg}{\cos\theta + \mu_s \sin\theta}$ (מתחת למישור)

$\max(\cos\theta + \mu_s \sin\theta) \Rightarrow (\cos\theta + \mu_s\sin\theta)' = 0$

$-\sin\theta + \mu_s\cos\theta = 0, \quad \mu_s = tg\theta$

$tg\theta = 0.4 \quad \Rightarrow \quad \theta = 22^\circ$

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(התשובה בסעיף א' היא היחידה עבורה תיטא מתחת למישור ולכן מבין כל האפשרויות הנתונות עבורה הכח הכי קטן)

3. טעות בתשובות. התשובה $mg\ell(1-\cos\theta)$

4. $m_1 v = (m_1 + m_2)u$

$\Delta E = \frac{m_1 v^2}{2} - \frac{(m_1+m_2)u^2}{2} = 200\ J$

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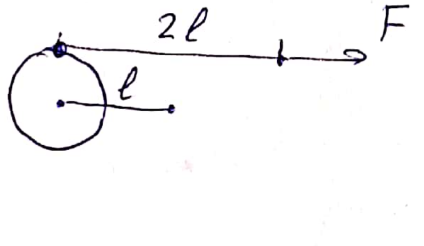
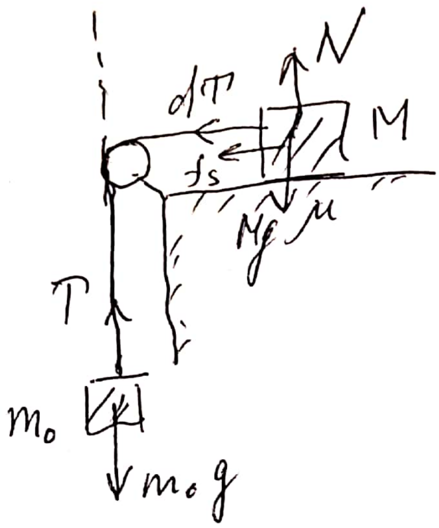
6.



$W = F \cdot 2\ell$

ב

N1



$$\begin{cases} m_0 g = T \\ T \pm f_s = M\omega^2 d \end{cases}$$

$$f_{s\,max} = \mu_s N = \mu_s M g$$

$$m_0 g \pm \mu_s M g = M\omega^2 d$$

$$\omega_{\substack{max \\ min}} = \sqrt{\frac{(m_0 \pm M\mu_s)\, g}{Md}}$$

$$\sqrt{\frac{(m_0 - \mu_s M)\, g}{Md}} < \omega < \sqrt{\frac{(m_0 + \mu_s M)\, g}{Md}}$$

N2

$$\begin{cases} m_3 V = m_3 u_3 + m_1 u_1 \\ V - 0 = u_1 - u_3 \\ u_2 = 0 \end{cases}$$

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$m_3 = \frac{m}{2}$ $\quad m_1 = m_2 = m$

$u_3 = -\frac{V}{3} \qquad u_1 = \frac{2}{3} V$

$$\begin{cases} m_1 u_1 = (m_1 + m_2) u \\ \frac{m_1 u_1^2}{2} = \frac{k \Delta X_{max}^2}{2} + \frac{(m_1 + m_2) u^2}{2} \end{cases}$$

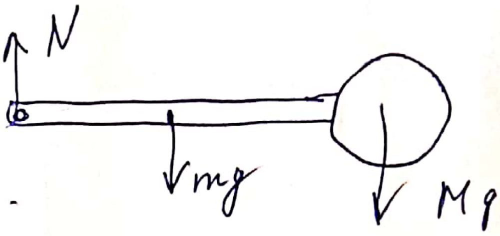
(2

$u = \frac{u_1}{2} = \frac{V}{3}$

$k \Delta X_{max}^2 = \frac{4}{9} m V^2 - \frac{2}{9} m V^2 = \frac{2}{9} m V^2$

$\Delta X_{max} = \frac{\sqrt{2}}{3} \sqrt{\frac{m}{k}} V$

N3



$$r_{cm} = \frac{m\frac{L}{2} + M(L+R)}{m+M}$$ (c

$$\Sigma \tau = I\alpha \qquad \Sigma\tau = mg\frac{L}{2} + Mg(L+R)$$

$$I = I_1 + I_2 \qquad I_1 = \frac{mL^2}{12} + m\left(\frac{L}{2}\right)^2 = \frac{mL^2}{3}$$

$$I_2 = \frac{2}{5}MR^2 + M(L+R)^2$$

$$I = \frac{mL^2}{3} + \frac{2}{5}MR^2 + M(L+R)^2$$

$$\alpha = \frac{m\frac{L}{2} + M(L+R)}{I}g \qquad a_{cm} = \alpha r_{cm} = \frac{\left[m\frac{L}{2} + M(L+R)\right]^2}{(m+M)I}g$$

$$\Sigma F = (m+M)a_{cm} \qquad (m+M)g - N = (m+M)a_{cm}$$

$$N = \left(1 - \frac{m\frac{L}{2} + M(L+R)^2}{I}\right)g$$

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$$\alpha = 0$$

$$a_{cm\tau} = 0$$

$$a_{cmr} = \omega^2 r_{cm}$$

$$(M+m)g r_{cm} = \frac{I\omega^2}{2}$$

$$\omega^2 = \frac{2(M+m)g r_{cm}}{I}$$

$$a_{cmr} = \frac{2(M+m)g}{I} r_{cm}^2 =$$

$$= \frac{2g}{I}\left[m\frac{L}{2} + M(L+R)\right]^2.$$

$$N = (m+M)g + (m+M)\frac{2g}{I}\left[m\frac{L}{2} + M(L+R)\right]^2$$