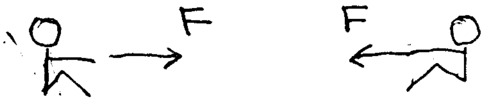
a) Frilegeme-diagrammer.



$$\vec{F}_B = -\vec{F}_A$$

$$a_1 = \frac{F}{m_1} \Rightarrow s_1 = \frac{1}{2}\left(\frac{F}{m_1}\right) t_1^2 \qquad (1)$$

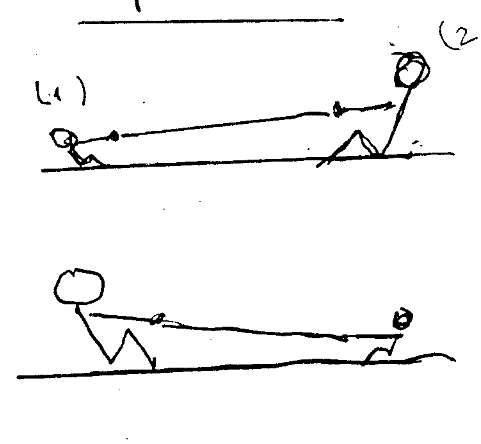
$$a_2 = \frac{F}{m_2} \Rightarrow s_2 = \frac{1}{2}\left(\frac{F}{m_2}\right) t_1^2$$

$$L = s_1 + s_2 = \frac{F}{2}\left(\frac{1}{m_1} + \frac{1}{m_2}\right) t_1^2 = \frac{F}{2}\,\frac{m_1 + m_2}{m_1 m_2}\, t_1^2$$

$$\underline{t_1 = \left[\frac{2L}{F}\,\frac{m_1 m_2}{m_1 + m_2}\right]^{1/2}}$$

$$(1) \Rightarrow \quad s_1 = \frac{1}{2}\,\frac{F}{m_1}\,\frac{2L}{F}\,\frac{m_1 m_2}{m_1 + m_2} = \underline{\frac{m_2}{m_1 + m_2} L}$$

$$s_1 \approx \begin{cases} L & m_1 \ll m_2 \\ L/2 & m_1 = m_2 \ \text{(Symmetri)} \\ 0 & m_1 \gg m_2 \end{cases}$$

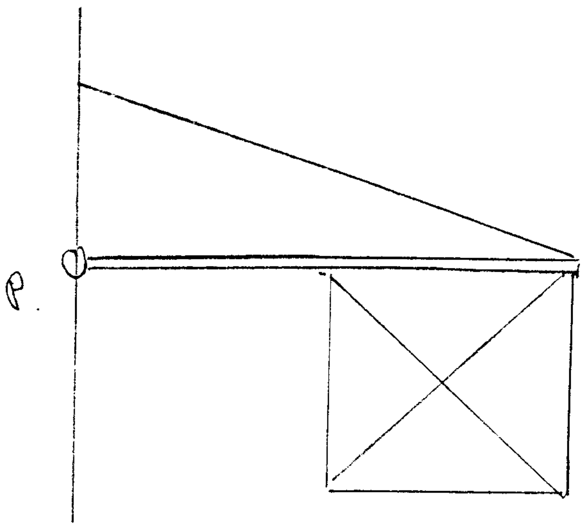


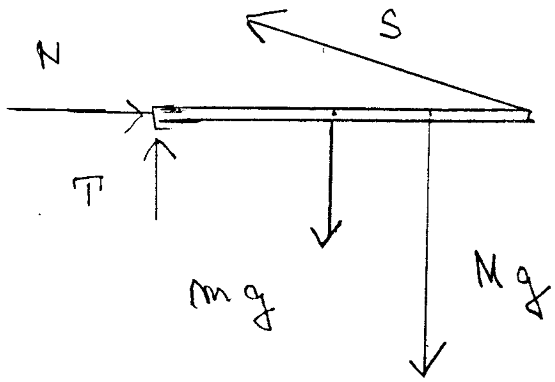
b) Ingen ytre krefter ⇒ massesenter i ro:
Møtested = massesenter.

$$s_1 = \bar{X} = \frac{1}{m_1 + m_2}\left[0 \cdot m_1 + L \cdot m_2\right] = \underline{\frac{m_2}{m_1 + m_2} L}$$

Uavhengig av styrke og tidsavhengighet av F.

L2





Løser bare $\underline{S}$. Forlanger null kraft-moment om P

$$0 = mg\cdot\frac{L}{2} + Mg\left(\frac{L}{2}+\frac{L}{4}\right) - S\cdot L\underbrace{\sin\theta}_{1/2}$$

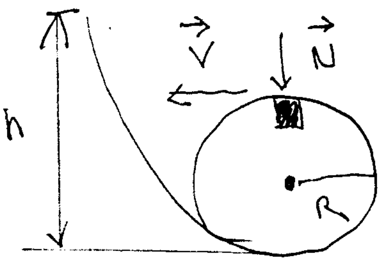
$$S L\cdot\frac{1}{2} = gL\left[\frac{m}{2}+\frac{3}{4}M\right] \Rightarrow$$

$$\underline{S = \left[m+\frac{3}{2}M\right] g}$$

Merk: N og T elimineres umiddelbart ved å <u>velge aksen gjennom P.</u>

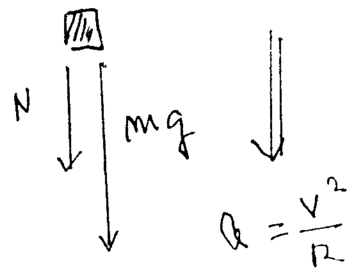
3.

a) Konservativ tyngdekraft $\Rightarrow$



$$mgh = mg\cdot 2R + \frac{1}{2}mv^2$$

$$\underline{v = \sqrt{2g(h-2R)}}$$



$$N + mg = mv^2/R$$

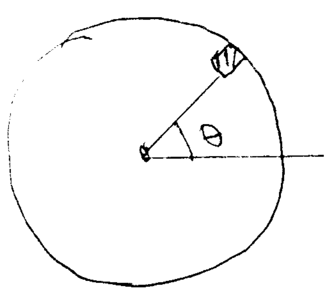
$$= \frac{2mg}{R}(h-2R) \Rightarrow$$

$$\underline{N = mg\left[\frac{2h}{R} - 5\right]}.$$

For fullstendig sirkelbane må

$$N \geq 0 \quad :: \quad \underline{h > h_0 = \frac{5}{2}R}$$

b)

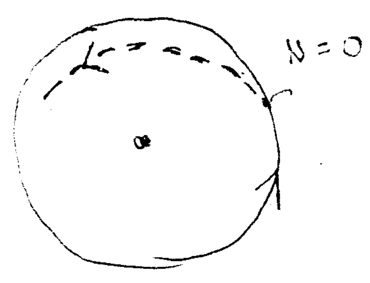


$h < h_0$. Ved gitt θ vil

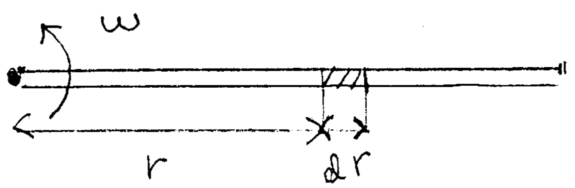
$v(h) < v(h_0)$

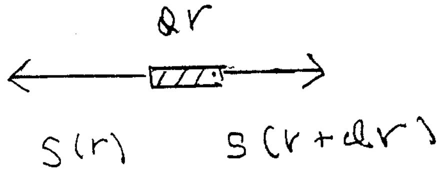
$$N(h) = \frac{m}{R}v^2(h) - mg\sin\theta$$

Når verdien 0 før $\theta = \pi/2$.



Kulen går inn i en parabolsk bane (som ved skrått kast) a)





Masse i dr: $dm = \frac{m}{L} dr$

$$\underbrace{S(r) - S(r+dr)}_{\text{Netto kraft innover}} = -dS = \underbrace{dm \cdot r\omega^2}_{\text{masse} \times \text{aksel.}} \Rightarrow$$

$$\underline{dS = -\left(\frac{m\omega^2}{L}\right) r\, dr}$$

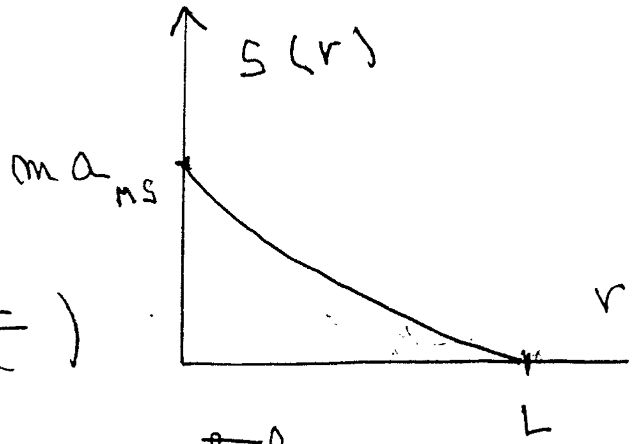
b) Integrasjon:

$$S = -\frac{m\omega^2}{2L} r^2 + C.$$

C bestemt av randbetingelse

$$0 = S(r=L) = -\frac{m\omega^2 L^2}{2L} + C \;:\; C = \frac{m\omega^2}{2L} L^2$$

$$\underline{S = \frac{m\omega^2}{2L}(L^2 - r^2)}$$



Kontroll:

$S(r=L) = 0$

$S(r=0) = m\omega^2\left(\frac{L}{2}\right)$

$= m a_{MS}$ som ventet.

... som alternativ randbet.