Lecture notes

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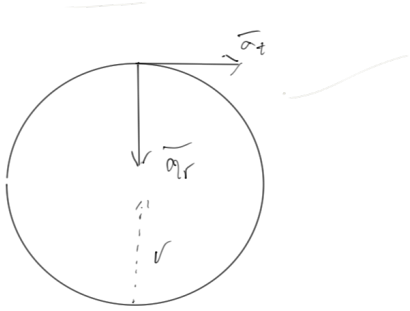
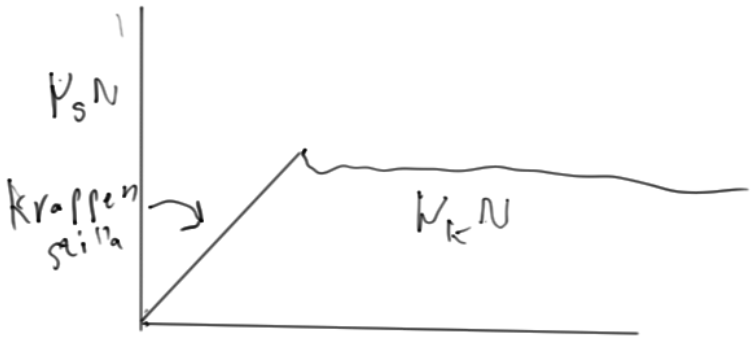
Idag: repition, friktion, newtons lagar, svängningar

Kinematik

$$\bar{r}$$

$$\bar{v} = \frac{d\bar{r}}{dt}, \bar{a} = \frac{d^2\bar{r}}{dt^2} = \frac{d\bar{v}}{dt} \bar{r_f} - \bar{r_i} = \bar{v_0}t + 1/2\bar{a}t^2$$

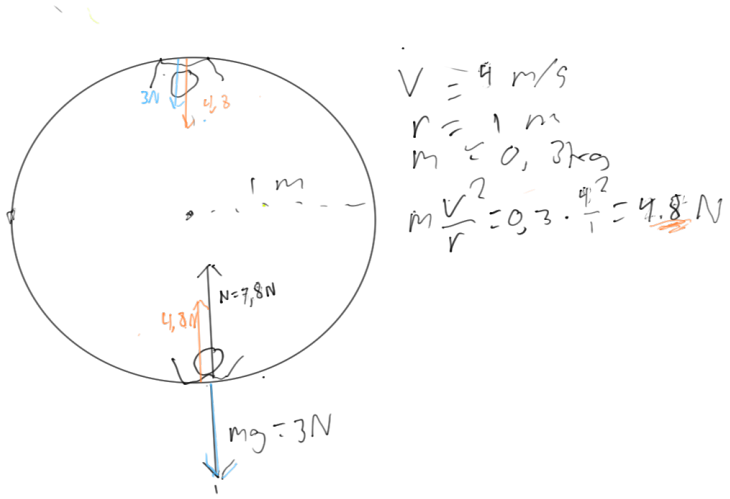


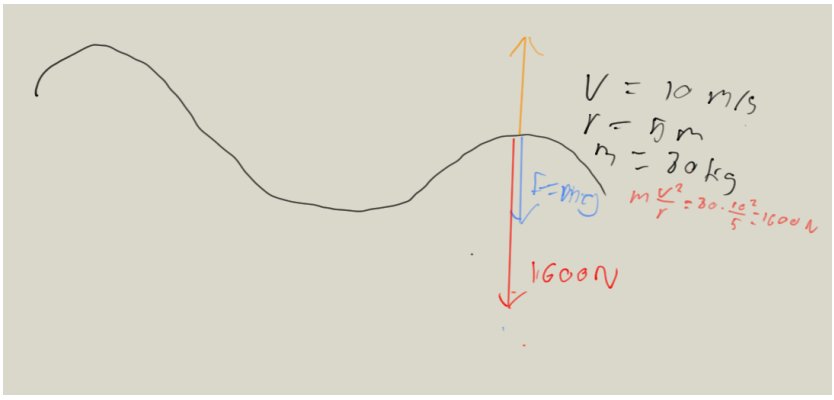


Figur 1: Centralrörelse

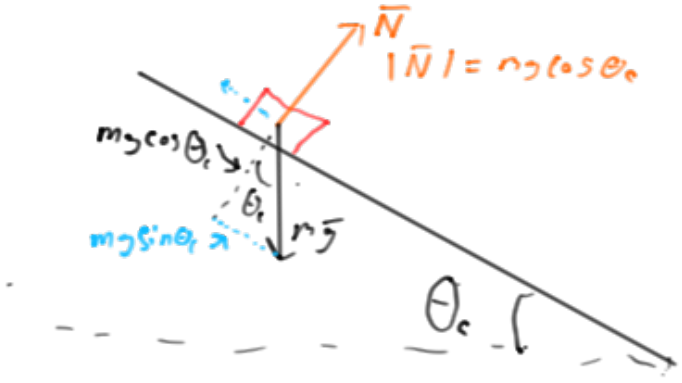
$$v = 4/s, r = 1m, m\frac{v^2}{r} = 0,3\frac{4^2}{1} = 4.8N$$

$$m = 0.3kg$$

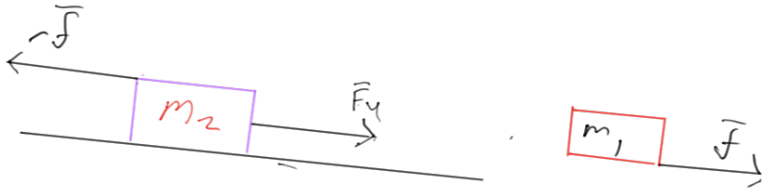




Friktion



Bestämma μ_s för en krit-ask.
Vid kritiska läget : $f = mg\sin(\theta_c)$. max $f = \mu_s mg\cos(\theta_c)$.

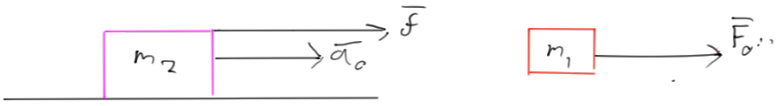


$\mu_s mg\cos(\theta_c) = mg\sin(\theta_c)$
För m_1 boxen:

$$f = \mu_s m_1 g$$
$$\mu_1 m_1 g = m_1 a_u$$
$$\underline{a_u = \mu_s g}$$

För m_2 boxen

$$F_u - f = m_2 a_u$$
$$F_u - \mu_s m_1 g = m_2 \mu_s g$$
$$\rightarrow \underline{F_u = (m_1 + m_2)\mu_s g}$$



Byt plats på kroken till den övre boxen

$$f = m_2 a_0 = \mu_s m_1 g, F_0 - \mu_s m_1 g = m_1 a_0$$
$$a_0 = \mu_s \frac{m_1}{m_2} g \rightarrow F_0 - \frac{m_1}{m_2}(m_1 + m_2)\mu_s g$$
$$\rightarrow F_0 = \frac{m_1}{m_2} F_u = \frac{4}{5} 27 = 22N$$

Svängningar

Hook fjäder $\bar{F}_s = -k\bar{x}$ k = fjäderkonstanten N/M.

$$\bar{F}_s = -k\bar{x} = m\frac{d^2\bar{x}}{dt^2}$$
$$m\frac{d^2x}{dt^2} + kx = 0$$
$$\rightarrow \frac{d^2x}{dt^2} + \frac{k}{m}x = 0$$

allmäns lösning:

$$x(t) = A\sin(\sqrt{\frac{k}{m}}t + \phi)$$

Inför winkel hastighet $\omega : \omega = \sqrt{\frac{k}{m}}$

$$x(t) = A\sin(\omega t + \phi)$$