# Uke 38 - Øving/Test 4

Sunday, 25 August 2024 17:39

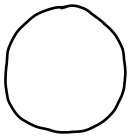
Treghetsmoment: "En gjenstands motstand mot å få rotasjonshastighet endret"

avstand fra rotasjonsaksen

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

## Oppgave 2 a

kun et skall, hul inni



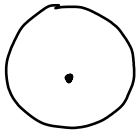
Kuleskall: $I_0 = \frac{2}{3}MR^2 = \frac{2}{3} \cdot 2.7 \cdot 10^{-3}\,kg \cdot (20 \cdot 10^{-3}m)^2 = \underline{\underline{7.2 \cdot 10^{-7}\,kgm^2}}$

$m = 2.7g$

$r = 20\,mm$

B

## 2 b



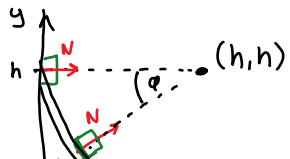
$I_0 = \frac{2}{5}MR^2 = \frac{2}{5} \cdot 7.26\,kg \cdot (60 \cdot 10^{-3}m)^2 = \underline{\underline{0.010\,kgm^2}}$ D

$M = 7.26\,kg$

$R = 60mm$

# ~~Test~~

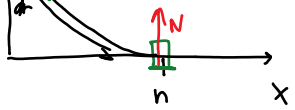
## ~~Oppgave 1~~



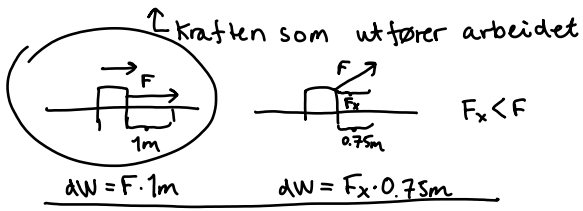

$V_0 = 0\,m/s$ $\quad f = 0$

Arbeid utført

$dW = F \cdot dr$ ← Avstand




↑ kraften som utfører arbeidet




$F_x < F$

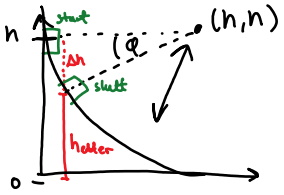
$dW = F \cdot 1m$ $\quad dW = F_x \cdot 0.75m$

$dW = N_x dr = 0$

$N_x = 0$

~~A~~

## ~~Oppgave 2~~




$E = mgh + \frac{1}{2}mv^2$

$E_{før} = E_{etter}$

$E_{p,før} + E_{k,før} = E_{p,etter} + E_{k,etter}$

$mgh + \frac{1}{2}mv_0^2 = mgh_{etter} + \frac{1}{2}mv^2$ ($v_0 = 0 m/s$)

↑ fart etter

$gh = gh(1-\sin\varphi) + \frac{1}{2}v^2$

$2gh = 2gh - 2gh\sin\varphi + v^2$

$v = \sqrt{2gh\sin\varphi}$ $\quad E$

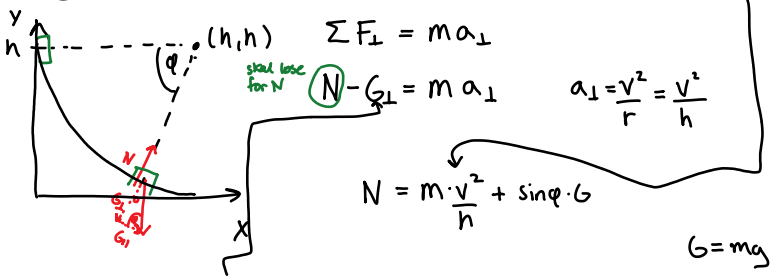
$\sin\varphi = \frac{\Delta h}{h}$

$\Delta h + h_{etter} = h$

$\sin\varphi \cdot h + h_{etter} = h$

$h_{etter} = h(1-\sin\varphi)$

## Oppgave 3




$\Sigma F_\perp = ma_\perp$

skal løse for N

$N - G_\perp = ma_\perp$

$a_\perp = \frac{v^2}{r} = \frac{v^2}{h}$

$N = m \cdot \frac{v^2}{h} + \sin\varphi \cdot G$

$G = mg$

$\sin\varphi = \frac{G_\perp}{G}$ $\quad G_\perp = \sin\varphi \cdot G$ $\quad N = \frac{m \cdot 2gh\sin\varphi}{h} + \sin\varphi \cdot mg$

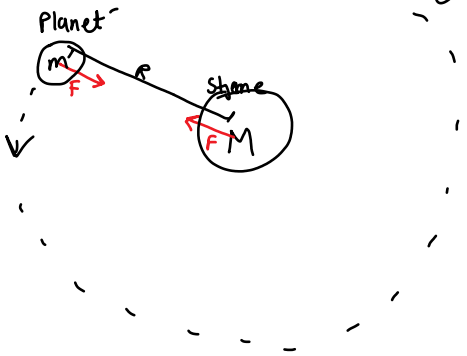
$N = 3mg\sin\varphi$ $\quad C$

masse til det objektet

## Oppgave 4

$$F = -\frac{GmM}{r^2}$$ ← masse til stort objekt; $r^2$ ← Avstand mellom dem

$G = 6.67 \cdot 10^{-11} \frac{Nm^2}{kg^2}$




$m \ll M$

$$\Sigma F_\perp = m a_\perp \qquad a_\perp = \frac{v^2}{r} = \frac{v^2}{R}$$

$$F = m \cdot \frac{v^2}{R}$$

$$\frac{GmM}{R^2} = \frac{mv^2}{R}$$

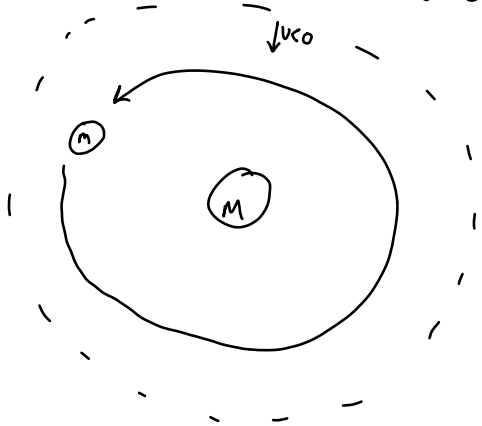
$$v^2 = \frac{GM}{R}$$

$$v = \sqrt{\frac{GM}{R}} \quad \subseteq$$

## Oppgave 5

Potensiell energi, $E_p$

$r = \infty$ $U = 0$ $\quad U \to 0$ når $r \to \infty$




$$U(r) = -\frac{GMm}{r} \quad A$$

## Oppgave 6

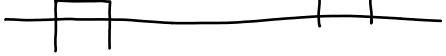
for $a$ = konstant

$V_0 = 0$ km/h

etter $V = 100$ km/h

$m = 1000$ kg

$V = 100$ km/h



$t = 6s$

Effekt

$$P = \frac{dW}{dt} \qquad dW = F \cdot dr$$

$$E_{før} + dW = E_{etter} \qquad E = mgh + \frac{1}{2}mv^2$$

$$0 + dW = 0 + \frac{1}{2}mv^2$$

$$dW = \frac{1}{2}mv^2 = \frac{1}{2} \cdot 1000kg \cdot \left(\frac{100}{3.6} m/s\right)^2 = 385802.5\,J$$

$$P = \frac{dW}{dt} = \frac{385802.5\,J}{6s} = \underline{64.3KW \quad D}$$

## ~~Oppgave 7~~

$$P = \frac{dW}{dt}$$

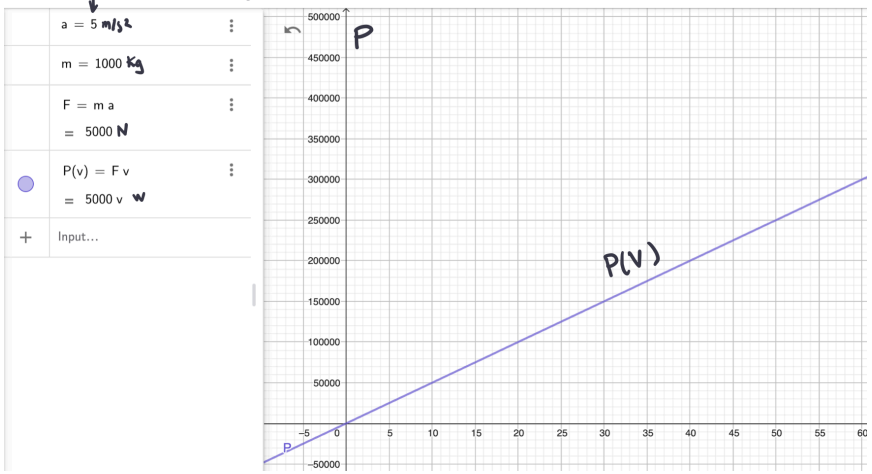
konstant

$P = F \cdot v$

↑ v øker

P er størst når V er størst som er etter 6s E

Konstant, her valgte JEG 5 for å lage grafen




$$dW = \frac{1}{2}mv^2$$

## Oppgave 8

$P = \text{konstant}$

$P = Fv = \text{konstant}$ $\quad F = ma$

$P = mav$ $\quad a = \frac{dv}{dt}$

$P = mv\frac{dv}{dt}$

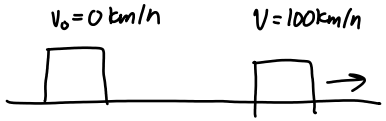
$$\int_0^t P\,dt = \int_0^v mv\,dv$$

$$[Pt]_0^t = \left[\tfrac{1}{2}mv^2\right]_0^v$$

$$Pt = \tfrac{1}{2}mv^2$$

$$v^2 = \frac{2Pt}{m} \qquad v = \sqrt{\frac{2Pt}{m}} \qquad \underline{\underline{D}}$$

~~Oppgave 9~~




$E_{før} + dW = E_{etter}$

$dW = \frac{1}{2}mv^2$ $\quad P = \frac{dW}{dt}$ $\quad m = 1000\text{kg}$

$v = 100\text{km/h}$

$P = \frac{\frac{1}{2}mv^2}{dt} = \underline{\underline{64\,\text{kW} \quad E}}$ $\quad dt = 6\text{s}$