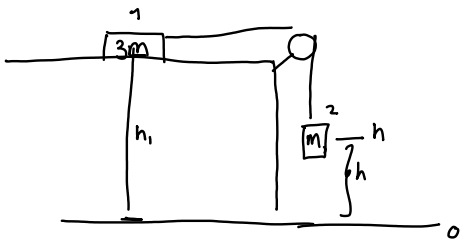
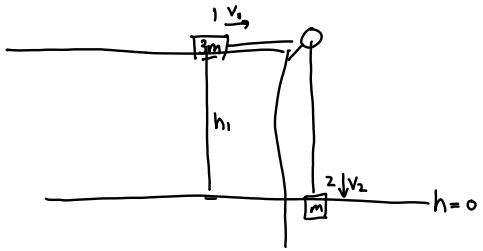
Uke 36 - Øving/Test 2: Bevegelse og krefter

Sunday, 25 August 2024 17:39

Test 2

Oppgave 2





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

$F = ma$

$E_{før} = E_{etter}$

$E_{før} = E_{p,1} + E_{p,2} + \overbrace{E_{K,1} + E_{K,2}}^{0}$

$= 3mgh_1 + mgh$

$E_{etter} = 3mgh_1 + \cancel{mg(h=0)}^{0} + \overbrace{\frac{1}{2}(3m)v_1^2}^{E_{K,1}} + \frac{1}{2}mv_2^2$

$v_1 = v_2 = v$

$E_{før} = E_{etter}$

$3mgh_1 + mgh = 3mgh_1 + \frac{1}{2}\cdot 3mv^2 + \frac{1}{2}v^2m$

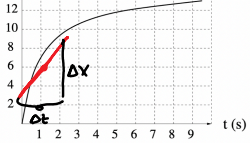
$mgh = 2\frac{1}{2}mv^2$

$v^2 = \frac{gh}{2}$

$v = \sqrt{\frac{gh}{2}}$ **B**

Oppgave 5

t=0 t



Grafen viser posisjon x (m) som funksjon av tid t (s) for en person som løper og går langs en rett vei. Personens hastighet ved $t = 1$ s er da ca

A 2 km/h
B 11 km/h
C 20 km/h
D 29 km/h
E 38 km/h

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

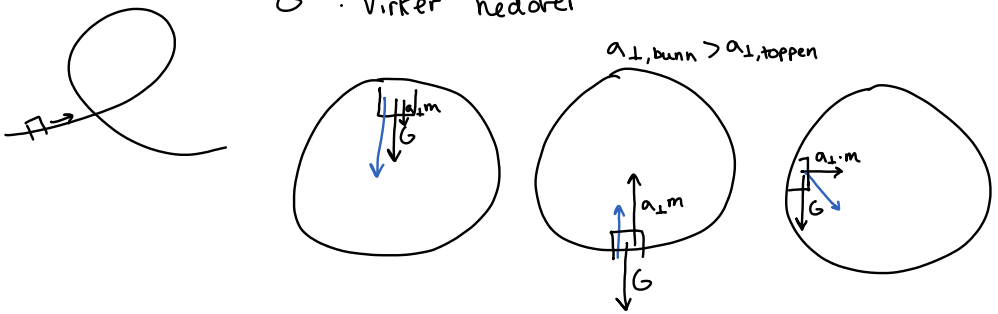
$$\frac{\Delta x}{\Delta t} = \frac{(10-4)m}{(2-0)s} = 3\,m/s = 3\,m/s \cdot 3.6\,\frac{km/h}{m/s} = 10.8\,km/h \approx 11\,km/h$$

Oppgave 8

B

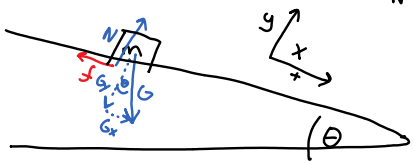
$F_\perp = ma_\perp = \frac{v^2}{r}$: virker innover mot sentrum av sirkelbevegelse

G : virker nedover



Oppgave 9

N1:



$\Sigma F_x = 0$ $\quad \Sigma F_x = G_x - f \overset{!}{=} 0$

$\Sigma F_y = 0$ $\quad \Sigma F_y = N - G_y \overset{!}{=} 0$

$\cos\theta = \frac{G_y}{G} \rightarrow G_y = \cos\theta \cdot G$

$\sin\theta = \frac{G_x}{G} \rightarrow G_x = \sin\theta \cdot G$

$G_x - f = 0$

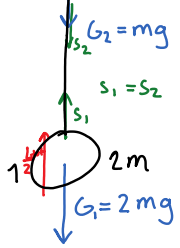
$G_x = f$

$\sin\theta \cdot G = f$

$\sin\theta \cdot mg = f$ D

Oppgave 10

$G_{tot} = L_{tot}$



$$G_1 + G_2 = L_{tot}$$

$$2mg + mg = L_{tot}$$

$$3mg = L_{tot}$$

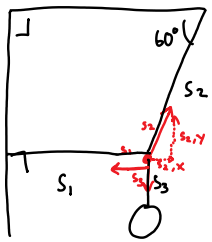
Ser kun kloss 1:

$$G_1 = \frac{L_{tot}}{2} + S_1$$

$$S_1 = G_1 - \frac{L_{tot}}{2}$$

$$S_1 = 2mg - \frac{3mg}{2} = \frac{1}{2}mg$$ B

Oppgave 12



N1: $\Sigma F_x = 0$

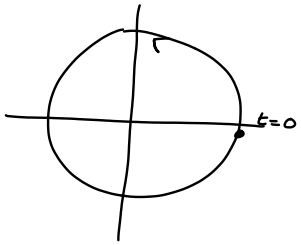
$\Sigma F_y = 0$

$$\Sigma F_x = S_{2,x} - S_1 \overset{!}{=} 0 \quad (S_{2,x} = S_1)$$

$$\Sigma F_y = S_{2,y} - S_3 \overset{!}{=} 0 \quad (S_{2,y} = S_3)$$

$S_2 > S_3 > S_1$ C

Oppgave 16



$\hat{r}(t) = \hat{x}\cos\omega t + \hat{y}\sin\omega t$

$\hat{\varphi}(t) = -\hat{x}\sin\omega t + \hat{y}\cos\omega t$

$$\frac{d\hat{r}}{dt} = -\hat{x}\omega\sin\omega t + \hat{y}\omega\cos\omega t$$

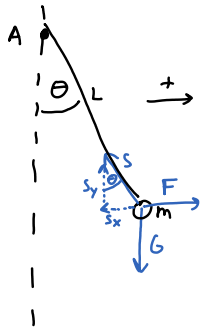
$$= \omega(-\hat{x}\sin\omega t + \hat{y}\cos\omega t) = \omega\hat{\varphi}(t)$$ A

Oppgave 17

$$\frac{d\hat{\varphi}}{dt} = -\hat{x}\omega\cos\omega t - \hat{y}\omega\sin\omega t$$
$$= \omega(-\hat{x}\cos\omega t - \hat{y}\sin\omega t) = -\omega\hat{r}(t)$$

Øving 2

Oppgave 1



N1: $\Sigma F = 0$

$\Sigma F_x = F - S_x = 0 \Rightarrow F = S_x$

$\Sigma F_y = S_y - G = 0 \Rightarrow S_y = G$

$\cos\theta = \frac{S_y}{S} \Rightarrow S_y = \cos\theta \cdot S$

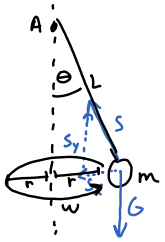
$\sin\theta = \frac{S_x}{S} \Rightarrow S_x = \sin\theta \cdot S$

$F = S_x = \sin\theta \cdot S \qquad S_y = G$

$F = \sin\theta \cdot S \qquad \cos\theta \cdot S = mg$

$F = \sin\theta \cdot \frac{mg}{\cos\theta} = \frac{\tan\theta \cdot mg}{c} \qquad S = \frac{mg}{\cos\theta}$

b)



N1: $\Sigma F_y = 0$

$\Sigma F_y = S_y - G = 0$

$S_y = G$

1) $\cos\theta \cdot S = mg \rightarrow S = \frac{mg}{\cos\theta}$

$\sin\theta = \frac{r}{L}$

$\Sigma F_\perp = m a_\perp$

$r = \sin\theta \cdot L$

$\Sigma F_\perp = S_x = m a_\perp$

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

$S_x = m\frac{v^2}{r}$

$S_x = \sin\theta \cdot S$

$\sin\theta \cdot S = m\frac{v^2}{r}$

$v = r\omega$

$\sin\theta \cdot S = m\frac{r^2\omega^2}{r}$

$\sin\theta \cdot \frac{mg}{\cos\theta} = mr\omega^2$

$\frac{\sin\theta \cdot g}{\cos\theta} = \sin\theta \cdot L\omega^2$

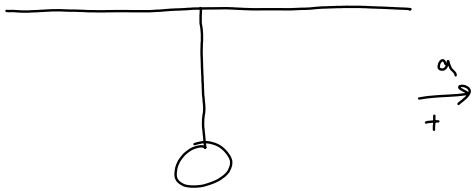
$\cos\theta = \frac{g}{L\omega^2}$ B

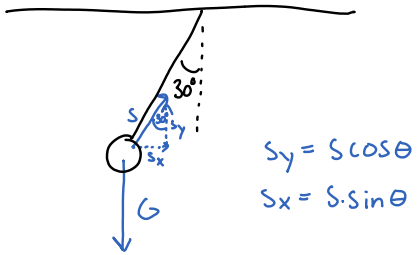
$\omega = \sqrt{\frac{g}{L\cos\theta}}$

$\cos\theta = 1$

$\omega = \sqrt{\frac{g}{L}}$

c)





$S_y = S\cos\theta$

$S_x = S\cdot\sin\theta$

N2: $\Sigma F = m \cdot a$

$\Sigma F_x = ma_x$ $\Sigma F_x = S_x$

$S_x = ma_x$

$S \cdot \sin\theta = ma_x$

$\Sigma F_y = 0$

$\Sigma F_y = S_y - G = 0$

$\Rightarrow S_y = G$

$S\cos\theta = mg$

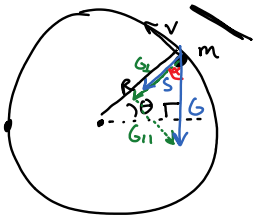
$\frac{mg}{\cos\theta} \cdot \sin\theta = m \cdot a_x$ $\qquad S = \frac{mg}{\cos\theta}$

$a_x = \tan\theta \cdot g$

$\theta = 30°$ $\quad \tan(30°) = \frac{1}{\sqrt{3}}$

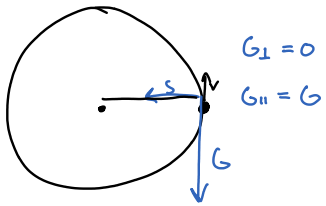
$a_x = \frac{1}{\sqrt{3}} \cdot g$ $\qquad E$

Oppgave 2



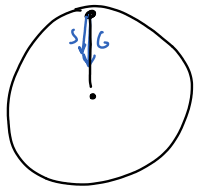
N2: $\Sigma F_{11} = m \cdot a_{11} = m\frac{dV}{dt}$

$a_{11} = \frac{dV}{dt}$



$G_\perp = 0$

$G_{11} = G$



$G_\perp = G$

$G_{11} = 0$

$\cos\alpha = \frac{G_\perp}{G}$ $\qquad \sin\alpha = \frac{G_{11}}{G}$

$G_{11} = \sin\alpha \cdot G$ $\qquad \alpha + 90° + \theta = 180°$

$\alpha = 90° - \theta$

$G_{11} = \sin(90° - \theta)G = \cos\theta \cdot G$

$\sin(90° - \theta) = \cos\theta$

$\Sigma F_{11} = -G_{11} = m\frac{dV}{dt}$ $\qquad V = rw$