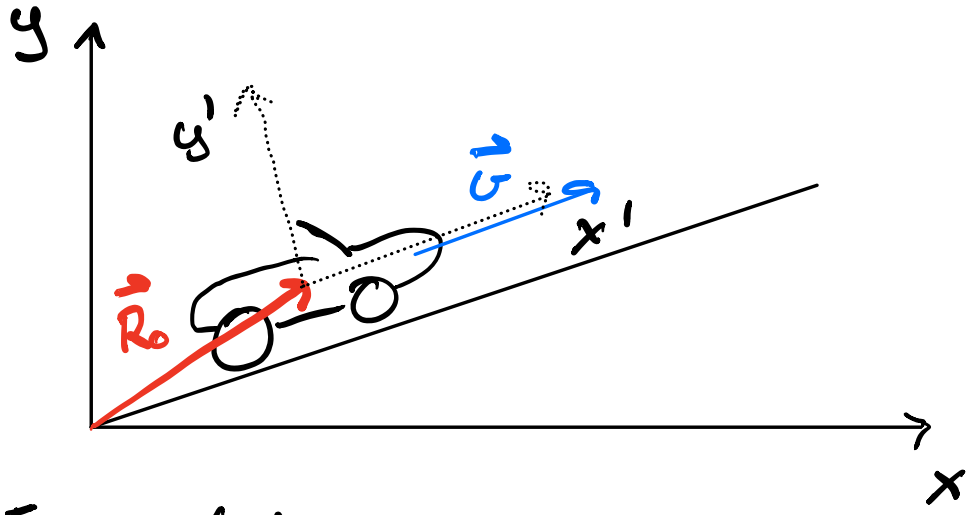
Kap 8 og 9

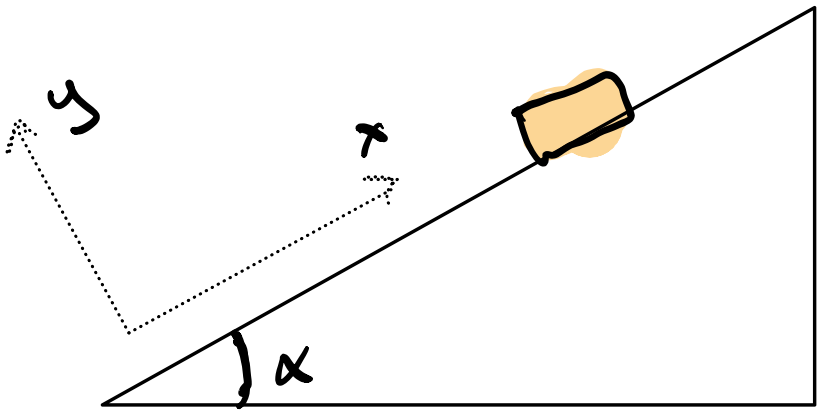


Fra x,y

$$\vec{R} = \vec{R}_0 + \vec{r}'$$

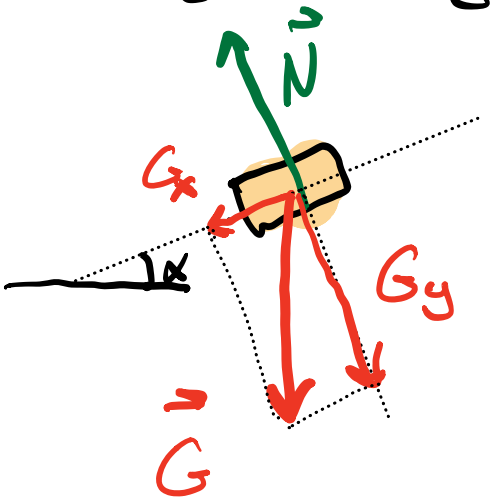
$$\frac{d\vec{R}}{dt} = \underbrace{\frac{d}{dt}\vec{R}_0}_{=0} + \underbrace{\frac{d\vec{r}'}{dt}}_{\vec{v}}$$

Skråplan



Anta ingen Friksjon

Frilegeme diagram



N. 2 lov

$\vec{G} + \vec{N} = m\vec{a}$

$G_x = |\vec{G}| \sin\alpha$

$G_y = |\vec{G}| \cdot \cos\alpha$

$\vec{G} = -|\vec{G}| \cdot \sin\alpha\, \vec{i} - |\vec{G}| \cdot \cos\alpha\, \vec{j}$

$$\vec{N} = |\vec{N}|\,\vec{j}$$

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x-vetning

$$-\underbrace{|\vec{G}|}_{=mg}\cdot \sin\alpha = m a_x$$

N.2.lov

$$-mg\cdot\sin\alpha = m a_x$$

y-vetning

$$-|\vec{G}|\cdot\cos\alpha\,\vec{j} + |\vec{N}|\cdot\vec{j} = m a_y$$

N.2.lov

$$a_y = 0$$

$$-mg\cdot\cos\alpha\,\vec{j} + |\vec{N}|\,\vec{j} = 0$$

↳ Akselerasjon til Kloss:

$$-mg\sin\alpha = ma_x \quad | \cdot \frac{1}{m}$$

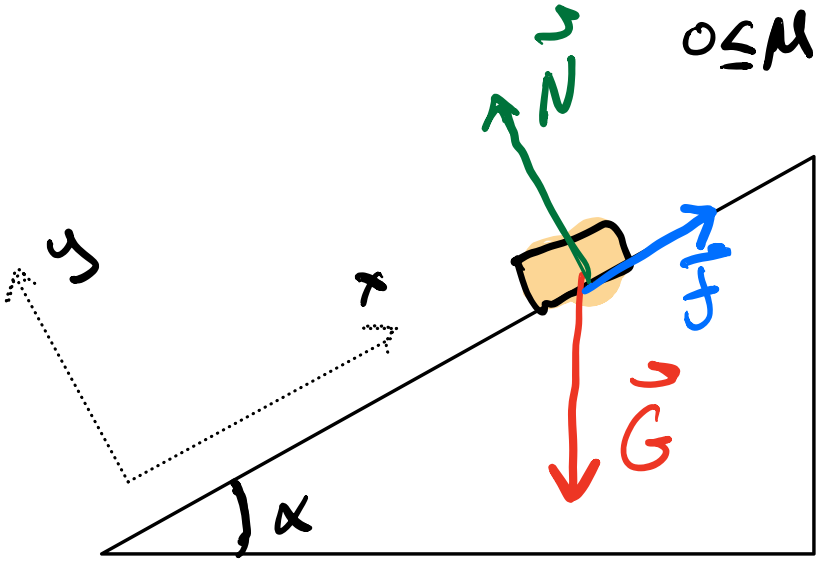
$$\boxed{a_x = -g \cdot \sin\alpha}$$

Friksjon:

$$f = \mu \cdot N$$

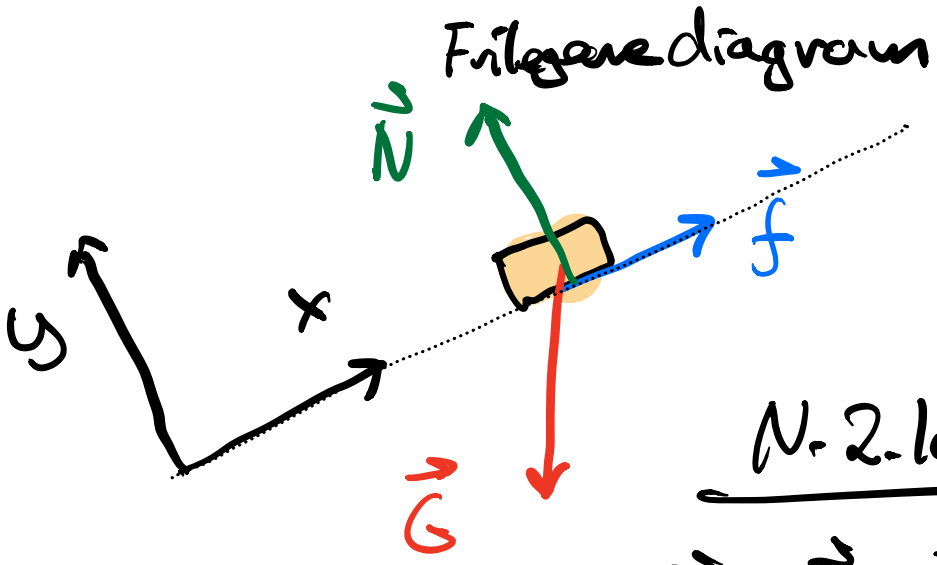
μ - friksjonstall

$0 \leq \mu$



Friksjon

$|\vec{f}| = \mu |\vec{N}|$



N. 2. lov

$$\vec{G} + \vec{N} + \vec{f} = m\vec{a}$$

$$G_x = |G| \sin\alpha$$

$$G_y = |\vec{G}| \cdot \cos\alpha$$

$$\vec{G} = -mg\sin\alpha\,\vec{i} - mg\cos\alpha\,\vec{j}$$

$$\vec{N} = |\vec{N}|\,\vec{j}$$

$$\vec{f} = |f|\,\vec{i}$$

x-retning

$$-mg\sin\alpha + |\vec{f}| = ma_x$$

y-retning

$$-mg\cos\alpha + |\vec{N}| = \underbrace{ma_y}_{=0}$$

$$|\vec{N}| = mg\cos\alpha$$

$$|\vec{f}| = \mu \cdot |\vec{N}| = \mu \cdot mg\cos\alpha$$

$$-mg\sin\alpha + |\vec{f}| = ma_x$$

$$-mg\sin\alpha + \mu \cdot mg\cos\alpha = ma_x \quad | \cdot \frac{1}{m}$$

$$a_x = \mu \cdot g \cdot \cos\alpha - g \cdot \sin\alpha$$

Anta $\mu = 0{,}3$

Ved hvilken vinkel begynner klossen å skli?

Finner vinkelen der $a_x = 0\ m/s^2$

$$a_x = \mu \cdot g \cdot \cos\alpha - g \sin\alpha = 0$$

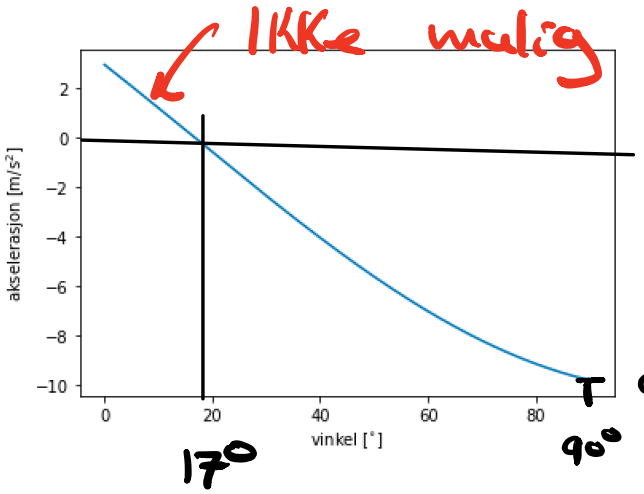
$$\mu \cdot g \cdot \cos\alpha = g \cdot \sin\alpha = 0 \,/\, \frac{1}{\cos\alpha}$$

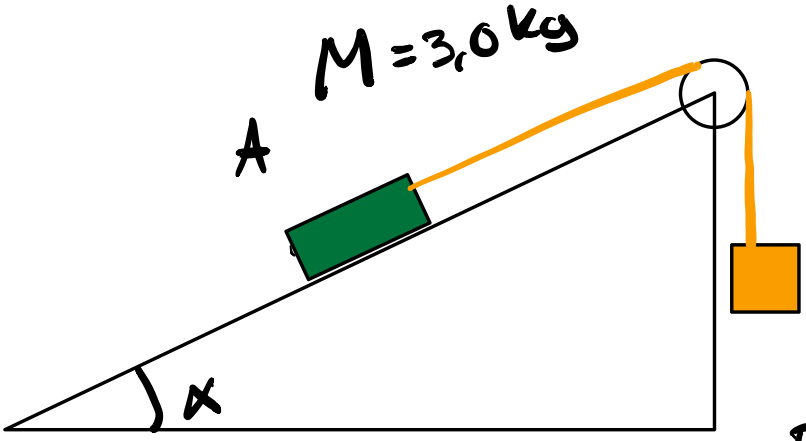
$$\mu = \frac{\sin\alpha}{\cos\alpha} = \tan\alpha \,/\, \tan^{-1}()$$

$$\alpha = \tan^{-1}(\mu) \qquad \mu = 0{,}3$$

$$\alpha = \tan^{-1}(0{,}3) = 16{,}7^\circ$$

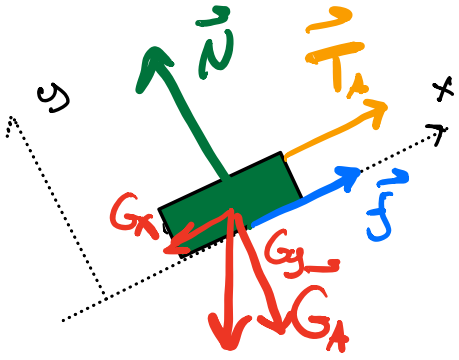
$$\underline{\underline{17^\circ}}$$

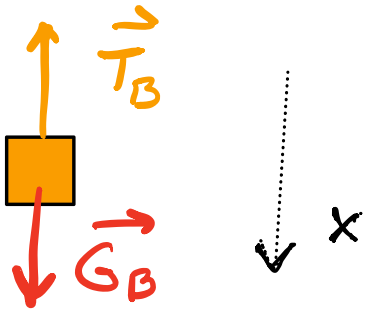




Friksjon M

Frilegemediagram





N. 2. lov Kloss A | N. 2. lov kloss B

$\vec{G}_A + \vec{N} + \vec{T}_A + \vec{f} = m\vec{a}_A$ | $\vec{G}_B + \vec{T}_B = m\vec{a}_B$

$|\vec{T}_A| = |\vec{T}_B| = T$ N. 3. lov

$|\vec{a}_A| = |\vec{a}_B| = a$ Tauet er stramt.

$G_x = Mg \sin\alpha$

$G_y = Mg \cos\alpha$

x-retning Kloss A. N. 2. lov

$-G_x + T + f = Ma_x$ (1)

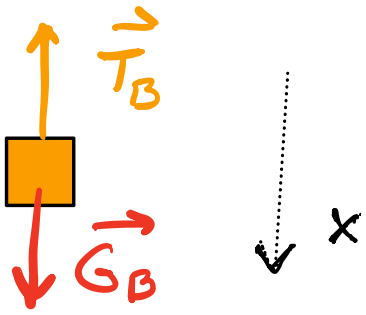
$-Mg\sin\alpha + T + f = Ma_x$

y-retning Kloss A. N. 2. lov

$-G_y + N = Ma_y$, $a_y = 0$

$-Mg \cdot \cos\alpha + N = 0$ (2)

N. 2. 100 Kloss B



$$|\vec{G}_B| - |\vec{T}_B| = m a_x$$

$$mg - T = ma \quad (3)$$

$a = a_x$

$f = \mu N$

(3) $T = (mg - ma)$

(2) $-Mg \cdot \cos\alpha + N = 0$

$N = Mg\cos\alpha$

$f = \mu \cdot M \cdot g \cdot \cos\alpha$

(1) $-Mg\sin\alpha + T + f = Max$

$$-Mg\sin\alpha + (mg - ma) + \mu \cdot M \cdot g \cdot \cos\alpha = M \cdot a$$

$$-Mg\sin\alpha + mg + \mu M \cdot g\cos\alpha = Ma + ma$$

$$g(m - Mg\sin\alpha + \mu \cdot M \cdot g\cos\alpha) = (M+m)a$$

$$a = g \cdot \frac{m - M \cdot \sin\alpha + \mu M \cdot \cos\alpha}{M+m}$$

$M = 3{,}0\,kg \quad m = 1{,}0\,kg \quad \mu = 0{,}3$