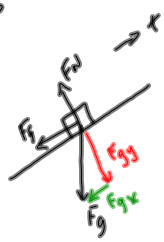
Incline Problems

#3.



$\vec{F}_{net} = m\vec{a}$

$-(F_f + F_{gx}) = ma$

MP|471

$m = 84\,kg$

$\theta = 22°$

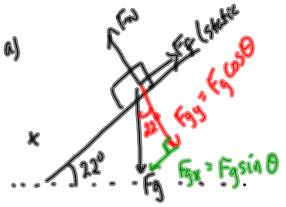
a) $\mu_s = 0.47$, will it slide down?

b) if it slides, $a = ?$

c) $F_a = ?$, to start to move up ramp

d) If same F_a and $\mu_k = 0.25$, $a = ?$

a)



If the crate begins to slide,

$F_{gx} \geq F_f$ (static)

F_f (static)

F_{gx}

$F_{gx} = F_g \sin\theta$

$F_{gx} = (84\,kg)(9.8\,m/s^2)\sin 22°$

$F_{gx} = 308.691\,N$

$F_f = \mu F_N$

$F_f = \mu F_{gy}$

$F_f = \mu F_g \cos\theta$

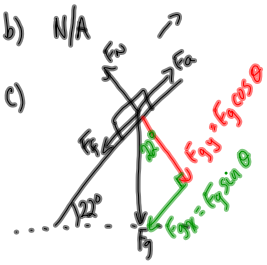
$F_f = (0.47)(84\,kg)(9.8\,m/s^2)\cos 2$

$F_f = 359.097\,N$

Since $F_{gx} < F_f$ (static) the crate does not slide down the ramp.

b) N/A

c)



To just start the crate moving up hill:

$F_a = F_f$ (static) $+ F_{gx}$

$F_a = 359.097\,N + 308.691\,N$

$F_a = 667.788\,N$

The force needed to just start moving uphill → $F_a = 6.7 \times 10^2\,N$

d) $\vec{F}_{net} = m\vec{a}$

$F_a - (F_{f(kin)} + F_{gx}) = ma$

$667.788\,N - (191.009\,N + 308.691\,N) = (84\,kg)a$

$168.088\,N = (84\,kg)a$

$a = 2.0\,m/s^2$

F_f (kinetic) $= \mu_k F_N$

$= \mu_k F_{gy}$

$= \mu_k F_g \cos\theta$

$= (0.25)(84\,kg)(9.8$

$\cos 22°$

$= 191.009\,N$

TO DO

① PP|474-475

② QUIZ - Thurs

(components, relative motion)