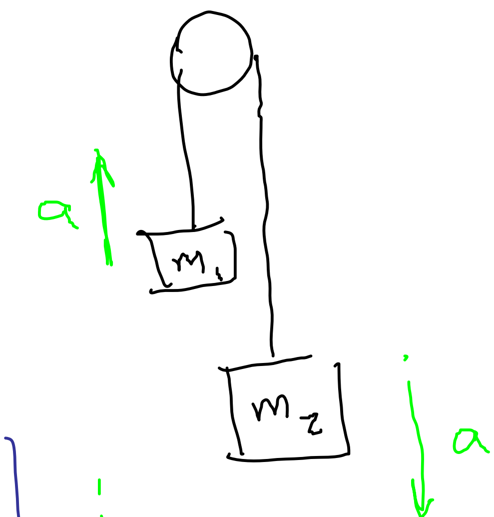
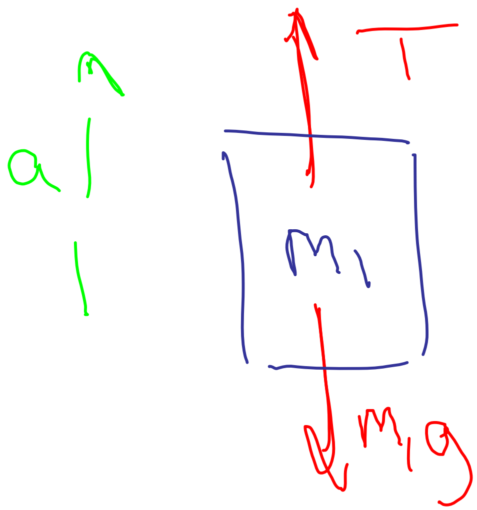
Phys 2110-4 9/28/11

Note Title 9/28/2011

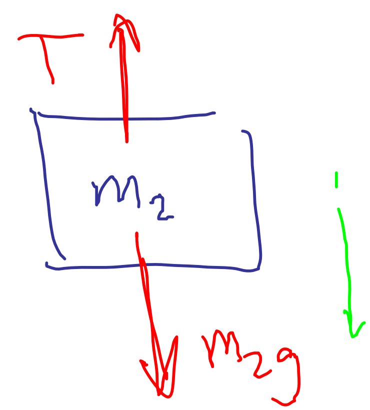
Atwood Machine





$$\boxed{T - m_1 g = m_1 a}$$

T, a



$$\boxed{m_2 g - T = m_2 a}$$

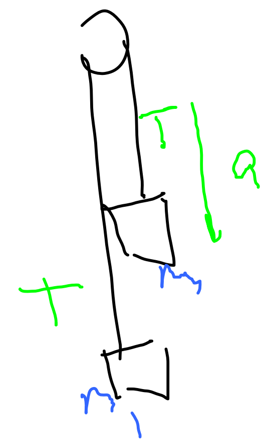
add eqns

$$m_2 g - m_1 g = m_1 a + m_2 a$$

Find a

$$g(m_2 - m_1) = a(m_1 + m_2)$$

$$\boxed{a = g\frac{(m_2 - m_1)}{(m_1 + m_2)}}$$



$m_2 = m_1$

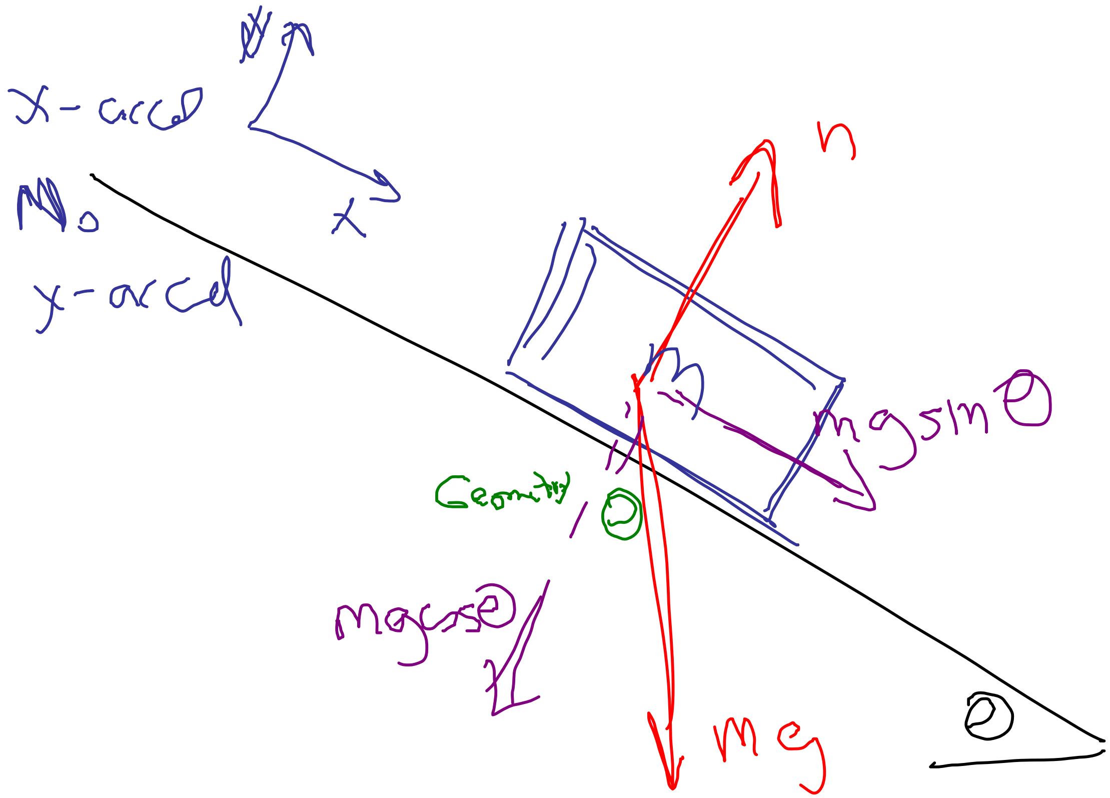
$a = 0$

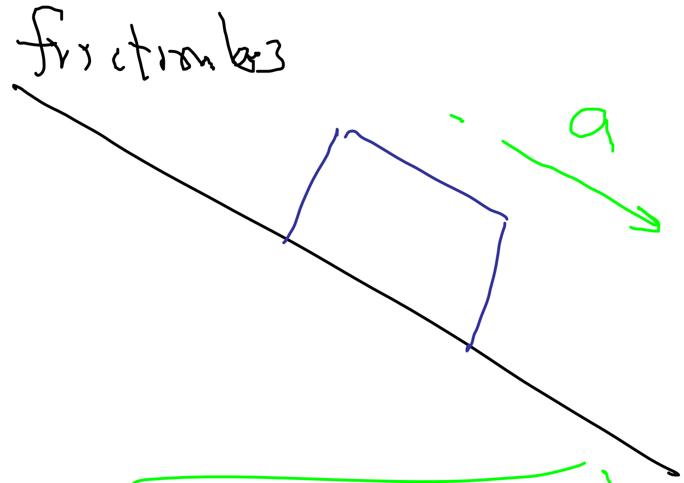
Find T . . .

$m_1 \to \infty$ $\quad a = g$

$m_2 \to \infty$

$a = -g$



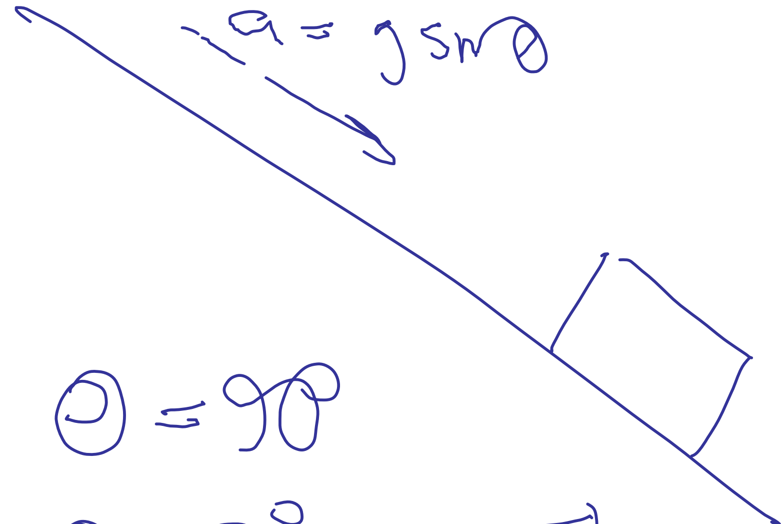


$$\boxed{a = g\sin\theta}$$

y-forces add to zero $\quad n - mg\cos\theta = 0$

x-forces add to ma_x $\quad mg\sin\theta = ma_x$

$$\cancel{m}g\sin\theta = \cancel{m}a_x$$



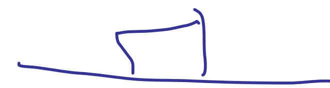
$$a_x = g\sin\theta$$

(Sliding fric)

$\theta = 90$

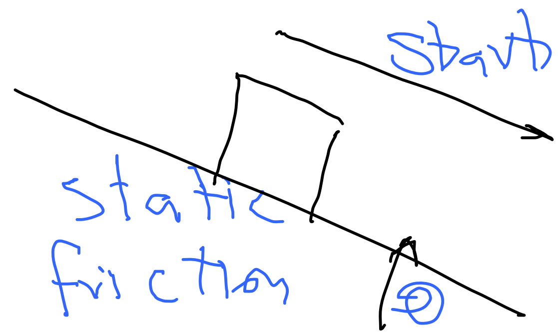
Friction forces Chap 5

$\theta = 0°$

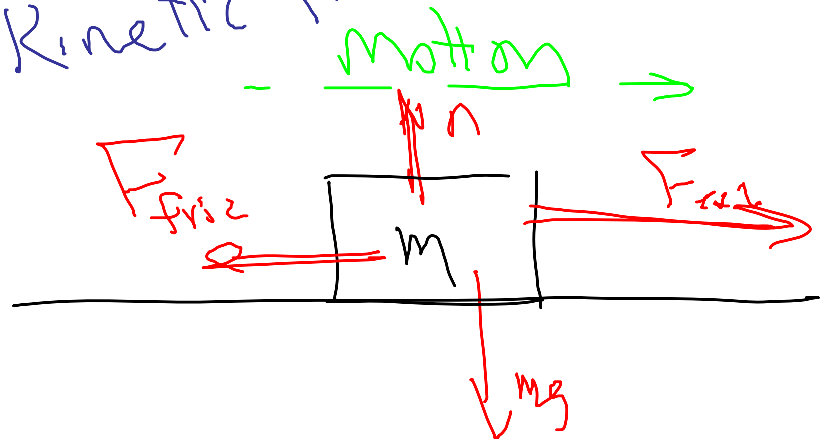


2 ways

Kinetic fric



Kinetic Friction



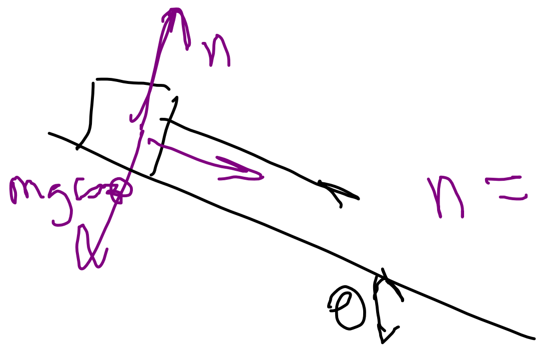
F_{fric} depends: Type of surface

$\rightarrow \propto n$

Speed ?

$$F_{fric,k} = \mu_k n$$

μ_k coefficient of kinetic friction



$n = mg\cos\theta$

Sec 5.4

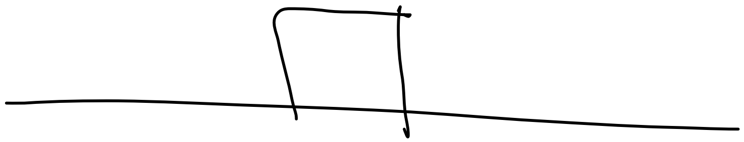
5.29 Hockey puck given initial speed of 14 m/s. Comes to rest in 56 m. Find coeff. of kinetic friction

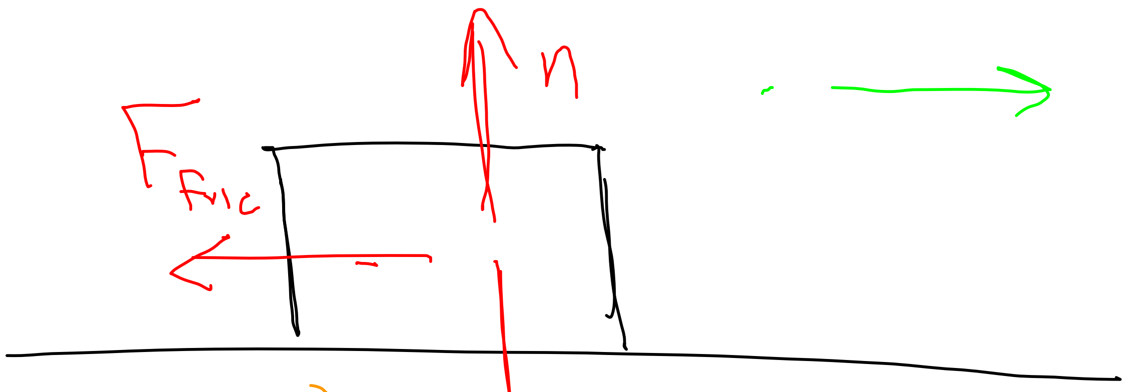
a_x.

$$v^2 = v_0^2 + 2a_x(x - x_0)$$

$$a_x = -1.75\ \mathrm{m/s^2}$$

$a_x = -1.75\ \frac{m}{s^2}$





$\mu_k = \frac{1.75\ \frac{m}{s^2}}{9.8\ \frac{m}{s^2}}$

$\boxed{= 0.179}$

$F_{fric} = \mu_k n$

$n = mg$

$\cancel{m} a_x = -\mu_k \cancel{m} g$

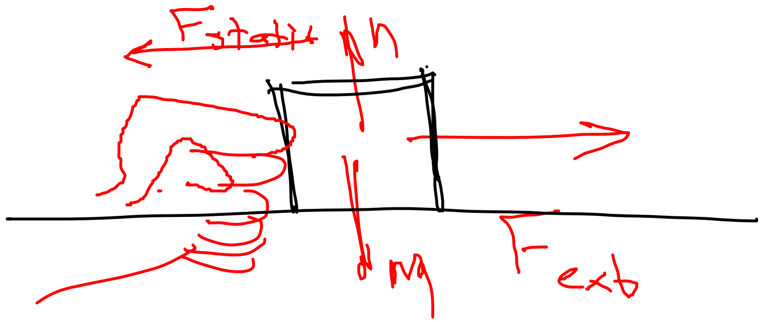
$= m a_x$

$F_{fric} = -\mu_k n$

$= -\mu_k m g$

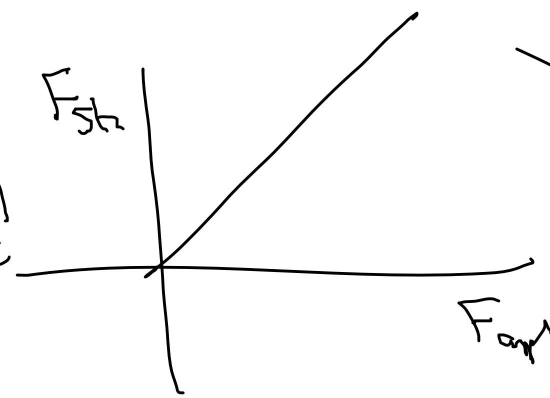
$a_x = -\mu_k g = -1.75\ \frac{m}{s^2}$

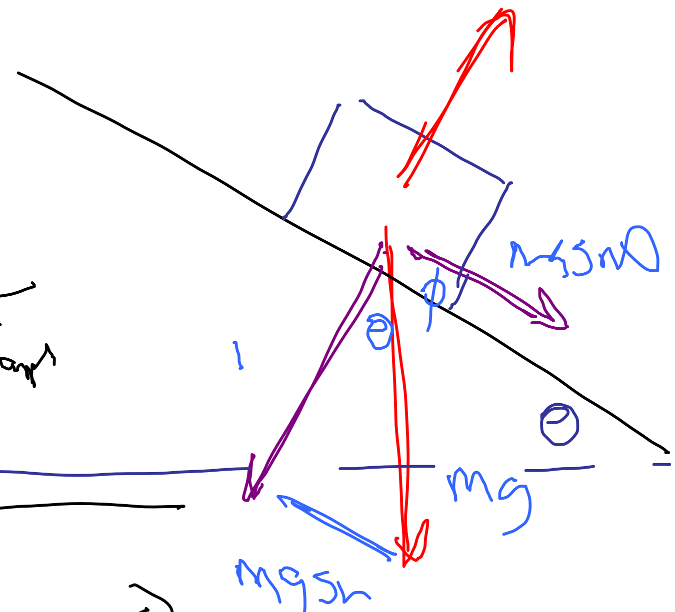
Static fric



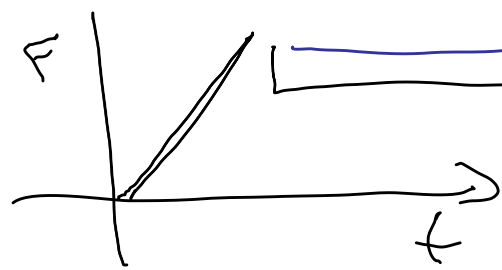
Formula for

$$F_{stat}^{(max)} = \mu_{static}\, n$$



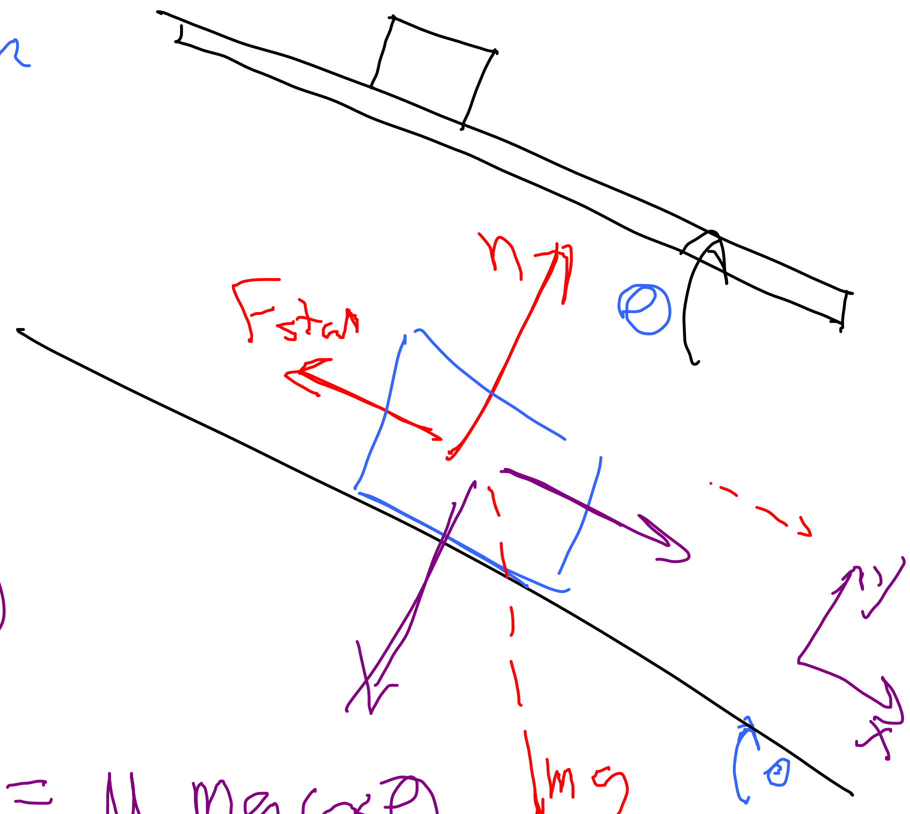


$$\mu_{stat} > \mu_{kin}$$



Inclined plane,

change θ until block starts to move.



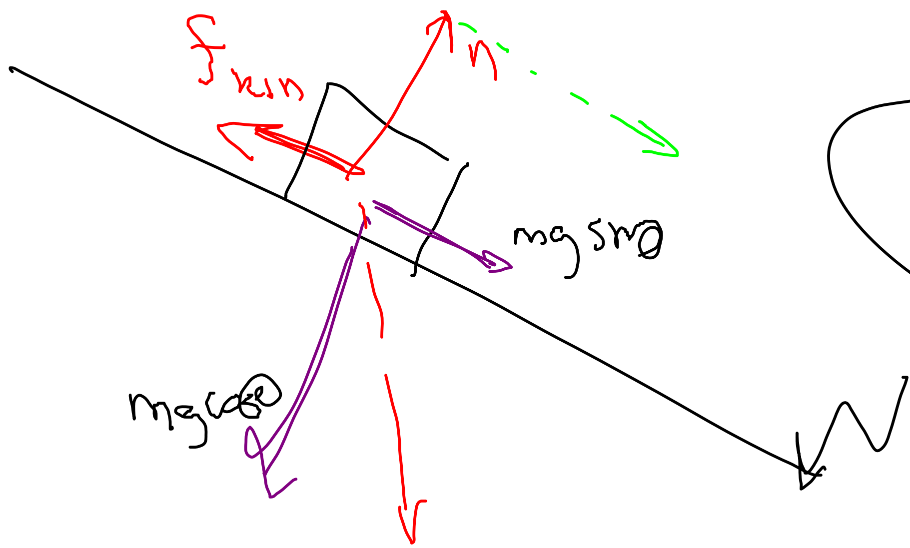
Forces all cancel

$$n = mg\cos\theta$$

$$mg\sin\theta = F_{stat}^{(max)}$$

$$\sin\theta = \mu_s \cos\theta \qquad = \mu_{stat}\, n = \mu_s\, mg\cos\theta$$

$$\mu_s = \frac{\sin\theta}{\cos\theta} = \tan\theta$$



$$\cancel{mg}(\sin\theta - \mu_k\cos\theta) = \cancel{m}a_x$$

$$a_x = g(\sin\theta - \mu_k\cos\theta)$$

Accel of mass <u>down slope</u>

$$\Sigma F = mg\sin\theta - f_{kin} = ma_x$$

$$= mg\sin\theta - \mu_k n = mg\sin\theta - \mu_k mg\cos\theta$$

Circular motion

$$a_c = \frac{v^2}{r}$$

Net force points toward center

$$F_c = \frac{mv^2}{r}$$