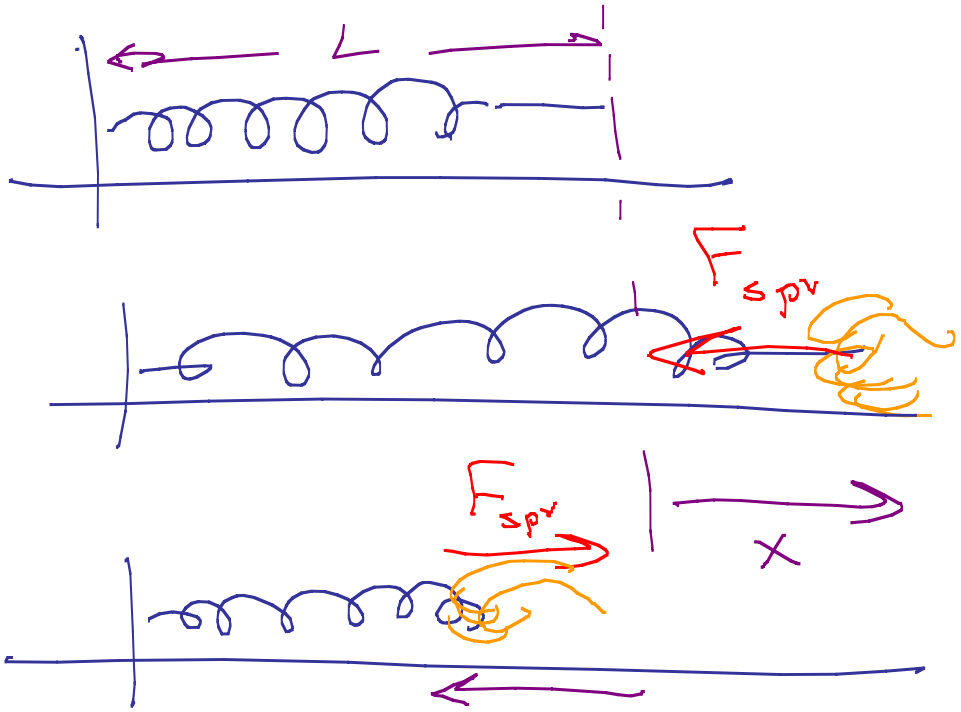
Phys 2110-5 9/26/12

Note Title 9/26/2012

Chap 4, Chap 5



Mag of spr's force is prop to the amt of elongation or compression

$x \quad |F| \propto x$

$$F_x = -kx$$

k = spring const, units $\frac{N}{m}$

$F_x = -kx$

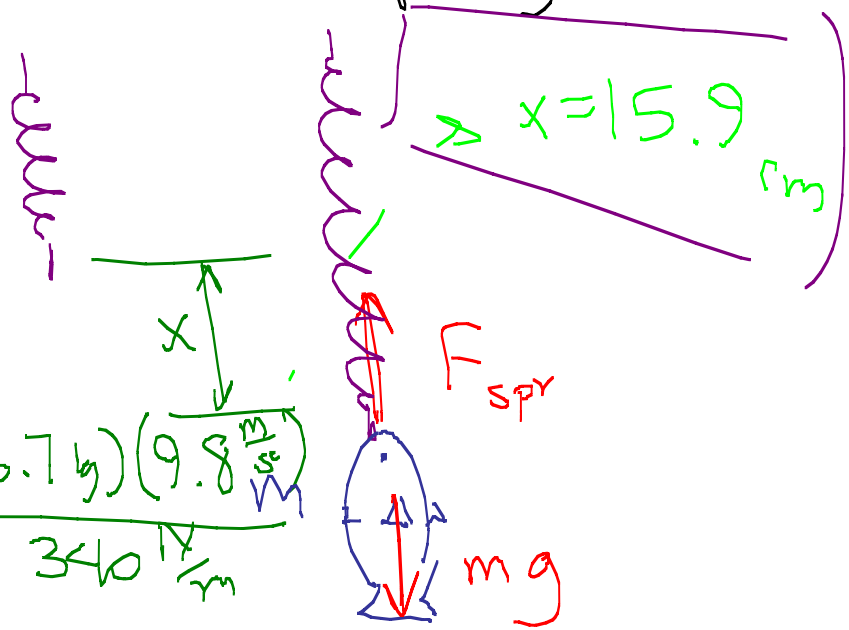
4.37 A spring with constant $k = 340 \frac{N}{m}$ is used to weigh a 6.7-kg fish. How far does spring stretch

$a_y = 0 \quad F_{net} = 0$

$|F_{spr}| = mg = kx$

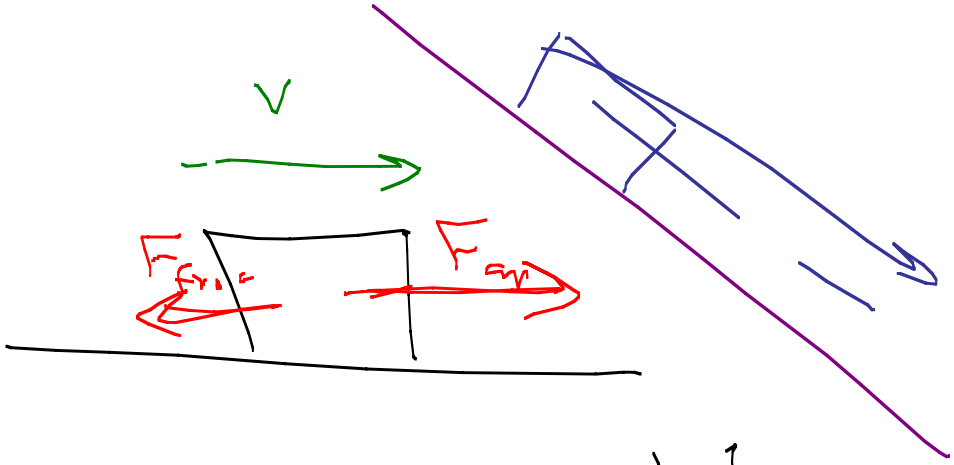
$x = \frac{mg}{k} = \frac{(6.7\,kg)(9.8\,m/s^2)}{340\,N/m}$

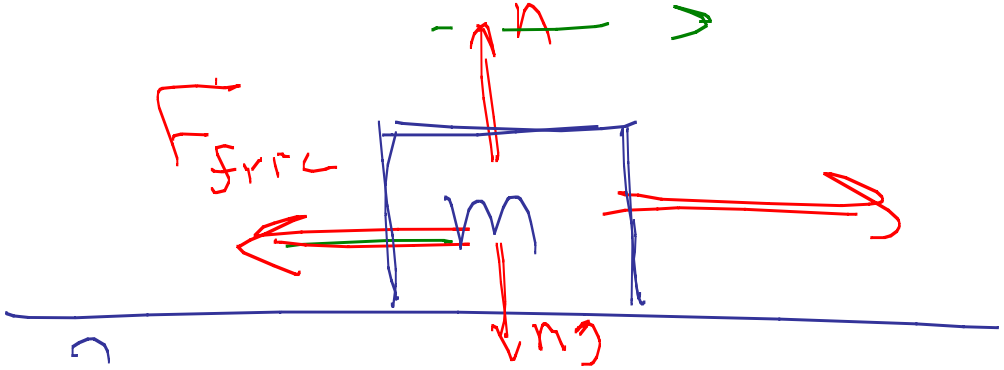
$\Rightarrow x = 15.9\,cm$



Friction Forces

Surface can exert a force opposing motion.

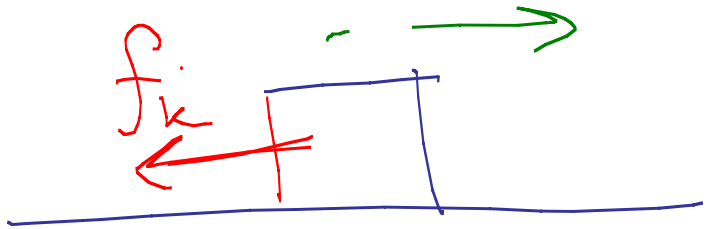




What would force of friction depend on.

Materials

? ⟹ Depends on normal force. Depends on speed (?) No.



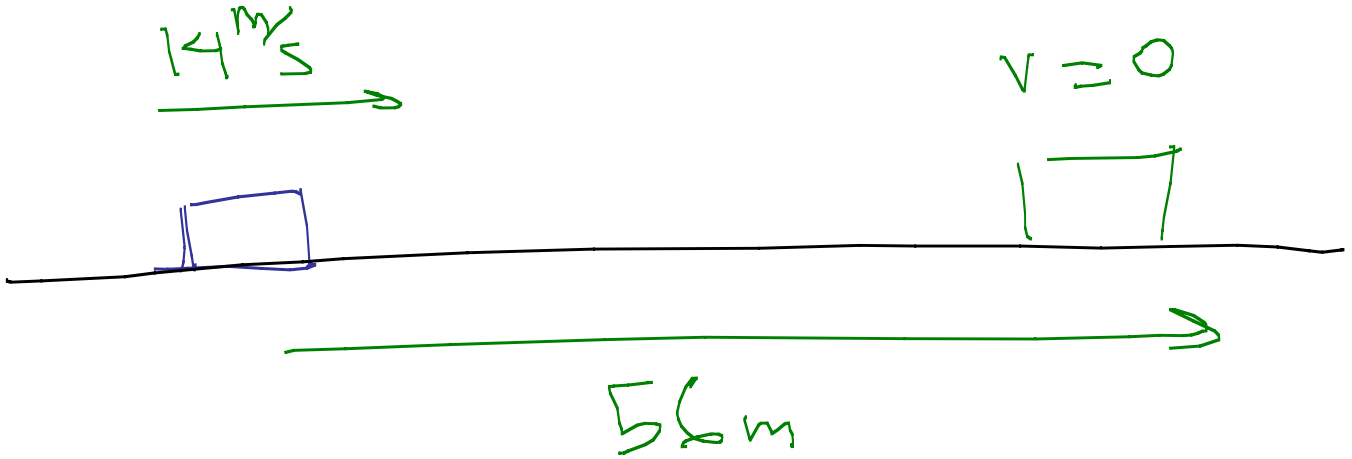
f_k force of kinetic friction

$f_k \propto n$ $\quad f_k = \mu_k n$

μ coefficient of kinetic fric.

n is often mg not always.

5.29 A hockey puck is given an initial speed of 14 m/s. If it comes to rest in 56 m, what is the coefficient of kinetic friction.

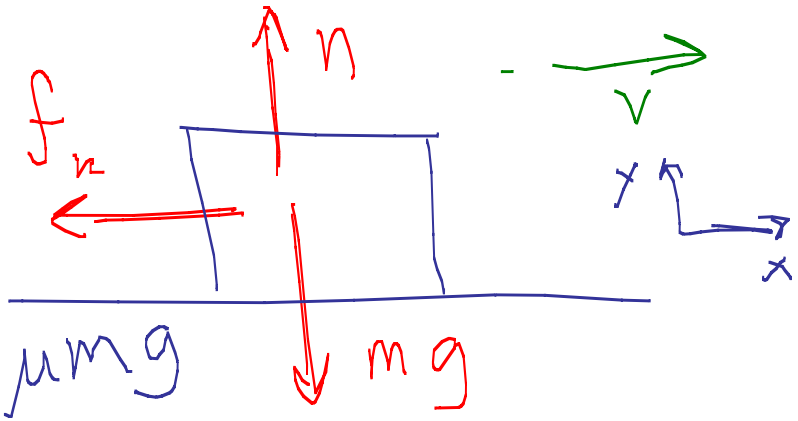


Can find accel:

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

v: 0 v_0: 14 m/s x: 56 m

$$a = -1.75 \ m/s^2$$



No a_y $\quad n = mg \quad f_k = \mu n = \mu mg$

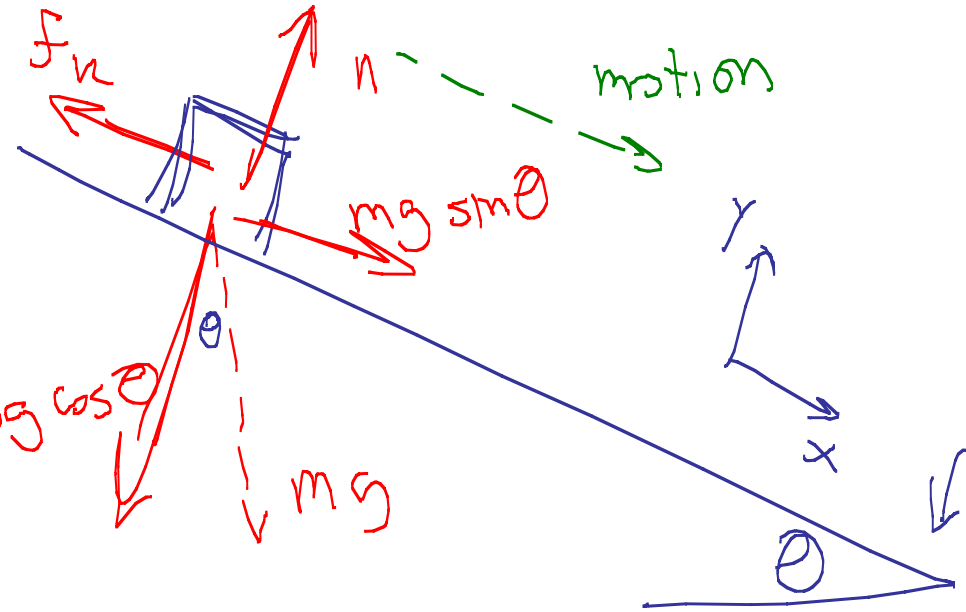
$$F_{net\,x} = -f_k = -\mu m g = m a_x$$

Mass cancels

$$\mu = -\frac{a_x}{g} = -\frac{\left(-1.75\ m/s^2\right)}{9.8\ m/s^2}$$

$$f_k = \mu n \qquad = 0.179$$

no units



Mass sliding down slope

slope w/ friction

y-forces cancel.

$n = mg\cos\theta \qquad f_k = \mu_k n = \mu_k mg\cos\theta$

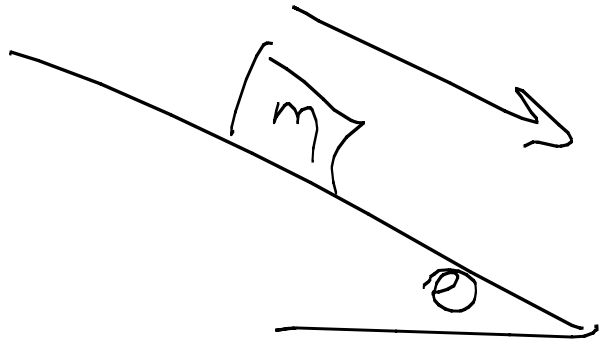
Forces in x-direction:

$$mg\sin\theta - f_k = mg\sin\theta - \mu_k mg\cos\theta = ma_x$$

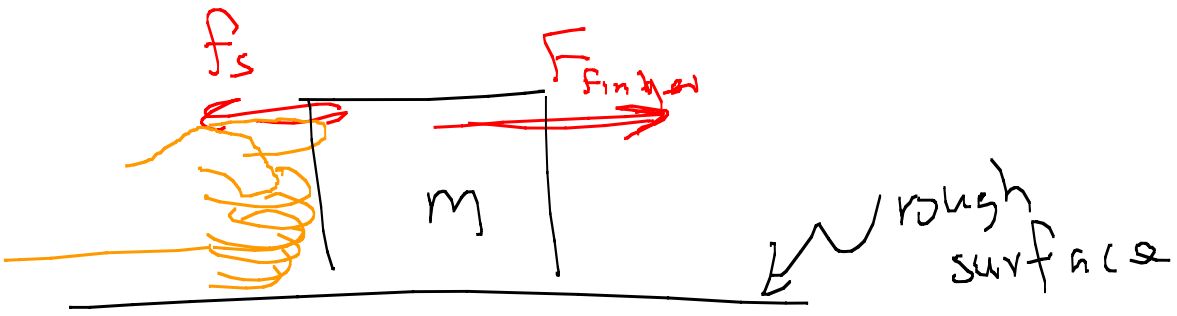
$$mg\sin\theta - \mu_k mg\cos\theta = ma_x$$

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

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



Static friction



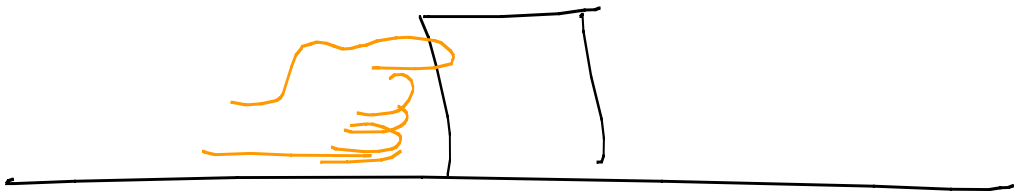
Until block moves

$f_{static} = F_{finger}$

f_{static} has maximum value

The important issue is what does it depend on?

f_s^{max}



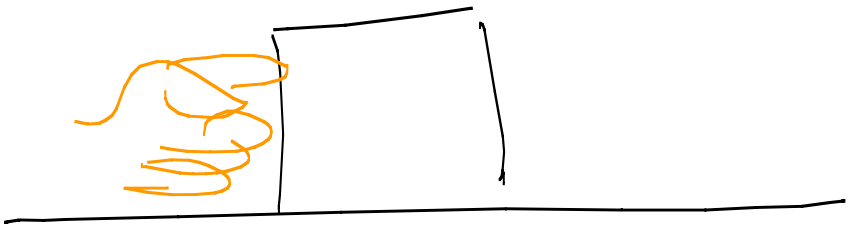
surfaces

normal force.

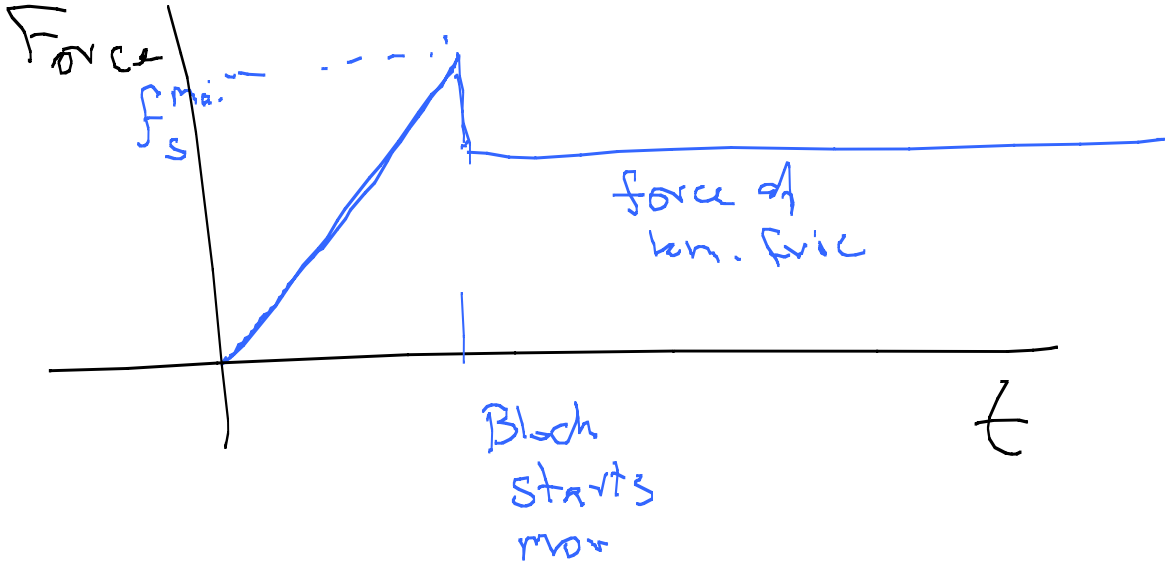
$f_s \leq$ something

$= \mu_s n$

μ_s coefficient of static friction.



Graph force of friction vs. time.



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