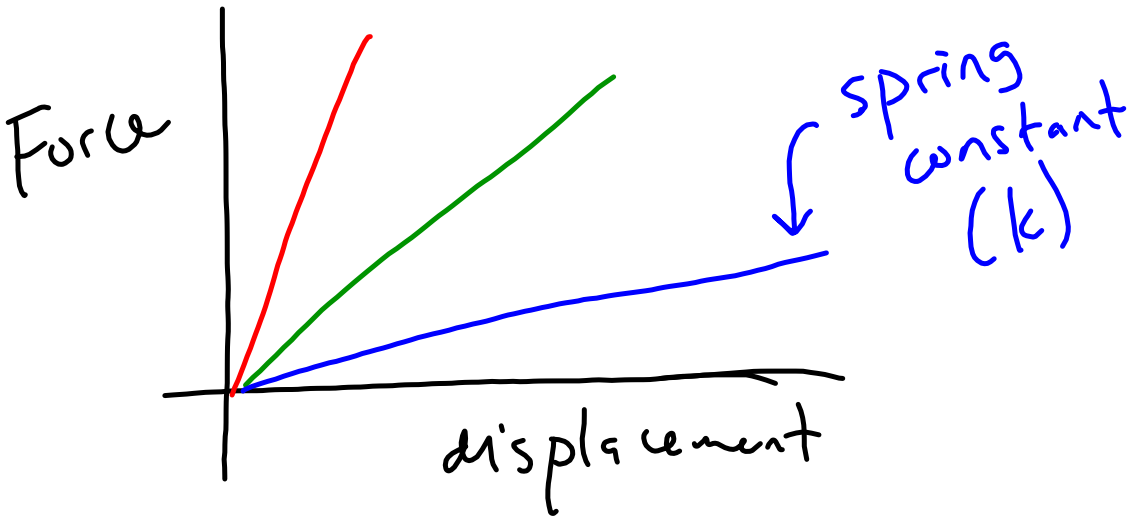
Springs



- Increasing slope → more difficult to pull/compress the spring

$$F = kx$$

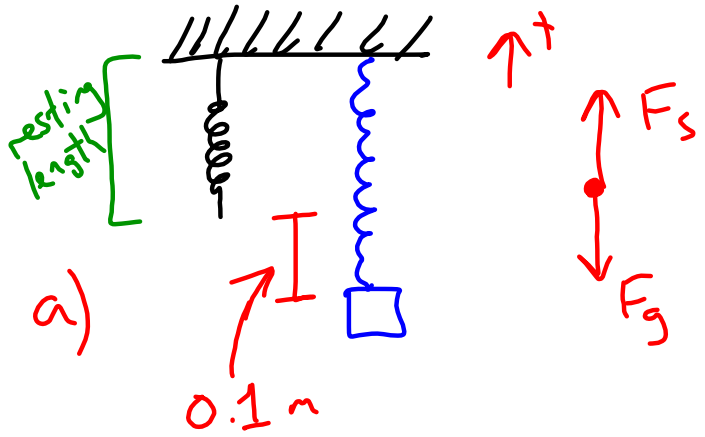
- Each spring has its own spring constant.

A mass (5 kg) is hanging vertically at rest from a spring, and the spring has stretched 10 cm from its resting position.

a) Draw a free-body diagram.

b) Write the net force equation.

c) Calculate the spring constant.



b) $\sum F = \emptyset$

$F_s - F_g = \emptyset$

$F_s = kx$

$F_g = ma_g$

$kx - ma_g = \emptyset$

$kx = ma_g$

$k = \frac{ma_g}{x}$

$x = 0.1\ m$

$m = 5\ kg$

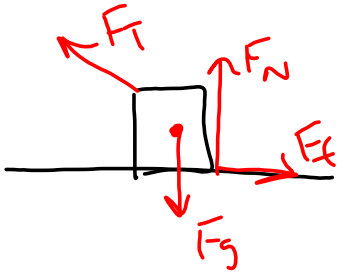
$a_g = 9.8\ m/s^2$

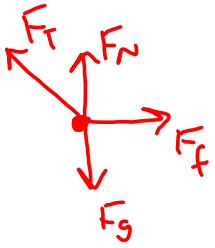
$= \frac{(5\ kg)(9.8\ m/s^2)}{0.1\ m}$

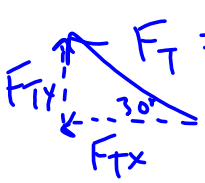
$= 490\ N/m$

WS 4 #1 → Level 4 Problem

WS 4 #3:







$\sin(30°) = \frac{F_{TY}}{F_T}$

$\cos(30°) = \frac{F_{TX}}{F_T}$

$F_{TY} = F_T \sin(30°)$

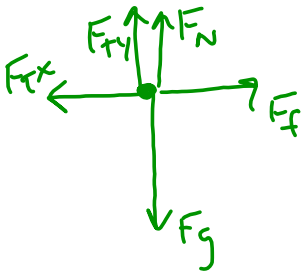
$= (400\,N)\sin(30°)$

$= 200\,N$

$F_{TX} = F_T \cos(30°)$

$= (400\,N)\cos(30°)$

$= 346\,N$



b) $\Sigma F_x = ma_x$

$F_f - F_{TX} = ma_x$

$a_x = \frac{F_f - F_{TX}}{M}$

$N = kg \cdot \frac{m}{s^2}$

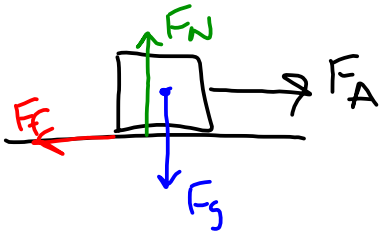
$= \frac{75\,N - 346\,N}{70\,kg}$

$\frac{kg \cdot m/s^2}{kg} = m/s^2$

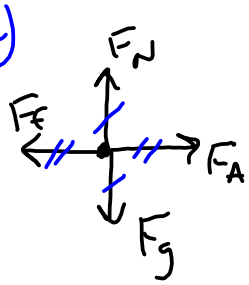
$= -3.88\,m/s^2$

WS 5#5 → Level 4

WS 5#1



a)



b) $F_f = \mu F_N$

$\mu = \frac{F_f}{F_N}$

$= \frac{50\,N}{300\,N}$

$= 0.167$

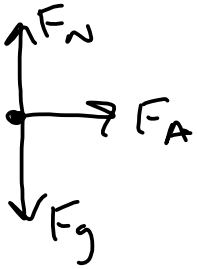
$\Sigma F_x = \emptyset$

$F_f = F_A = 50\,N$

$\Sigma F_y = \emptyset$

$F_N = F_g = 300\,N$

c) If $\mu_k = \emptyset$, $F_f = \emptyset$



$\Sigma F_x = ma_x$

$F_A = ma_x$

$a_x = \frac{F_A}{m}$

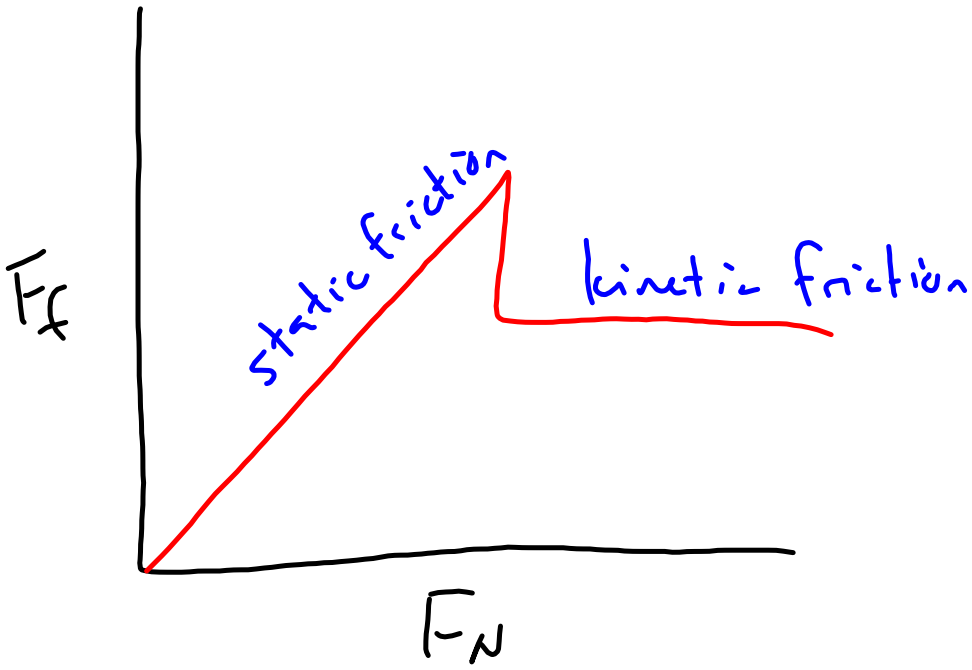
$= \frac{50\,N}{30.6\,kg}$

$= 1.63\,m/s^2$

$F_g = mg$

$m = \frac{300\,N}{9.8\,m/s^2}$

$= 30.6\,kg$


F_f
static friction
kinetic friction
F_N