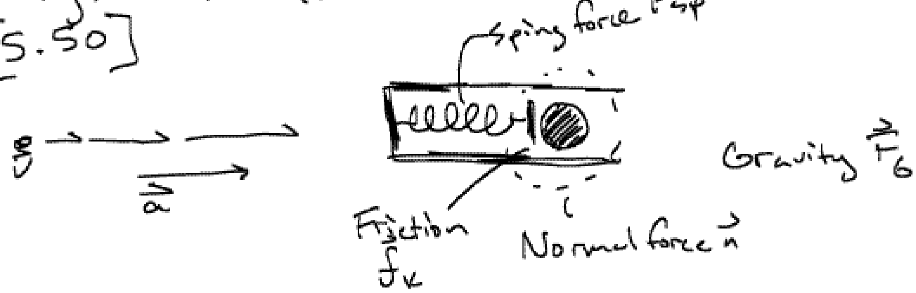
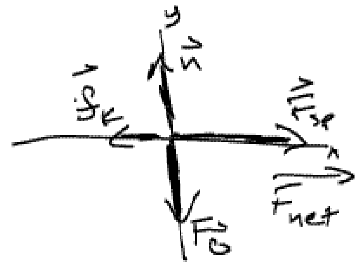
Phys 161 HW4

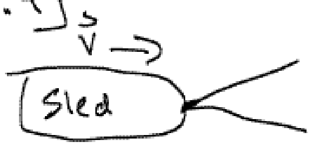
1) [5.50]

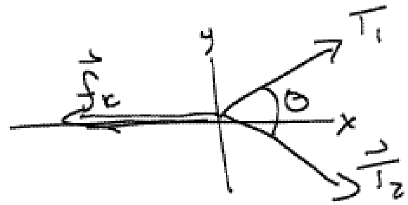




ball rests on floor since normal force equals gravitational force. Force of spring causes the acceleration.

2) [6.4]





Known
$f_k = 1000$ N
$\theta = 20°$
$v = 2.0$ m/s

Find
T_1 T_2

Since sled is not accelerating, it is a dynamic equilibrium & Newtons first law applies.

$(F_{net})_x = \Sigma F_x = T_{1x} + T_{2x} + f_{kx} = 0\,N$ $(F_{net})_y = \Sigma F_y = T_{1x} + T_{2y} + f_{ky} = 0\,N$

$T_1 \cos(\frac{1}{2}\theta) + T_2 \cos(\frac{1}{2}\theta) - f_k = 0\,N$ $T_1 \sin(\frac{1}{2}\theta) - T_2 \sin(\frac{1}{2}\theta) + 0\,N = 0\,N$

from the second equation $T_1 = T_2$

from the first equation

$2T_1 \cos 10° = 1000\,N \Rightarrow T_1 = \frac{1000\,N}{2\cos 10°} = \frac{1000\,N}{1.970} = 508\,N$

3) [6.6]

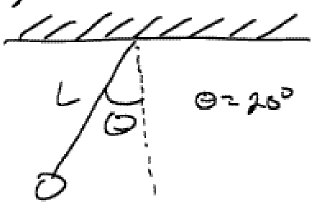
a) $a_x = \frac{(F_{net})_x}{m} = \frac{5N - 1N - (3\sin 20^\circ)N}{2kg} = 1.49 m/s^2$

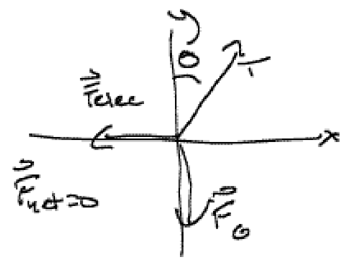
$a_y = \frac{(F_{net})_y}{m} = \frac{2.82N - (2\cos 20^\circ)N}{2kg} = 0 m/s^2$

b) $a_x = \frac{(F_{net})_x}{m} = \frac{(2\cos 15^\circ)N + (2\sin 15^\circ)N - 3N}{2kg} = -0.28 m/s^2$

$a_y = \frac{(F_{net})_y}{m} = \frac{1.414N + (2\sin 15^\circ)N - (2\cos 15^\circ)N}{2kg} = 0 m/s^2$

4) [6.30]





Known

$m = 1g = 0.0010 kg$

$L = 60 cm$ $\quad \Theta = 20^\circ$

Find

F_{elec} and T

Equilibrium condition is

$(F_{net})_x = T_x + (F_{elec})_x = T\sin\Theta - F_{elec} = 0N$

$(F_{net})_y = T_y + (F_G)_y = T\cos\Theta - mg = 0N$

solve y-equation

$T = \frac{mg}{\cos\Theta} = \frac{(0.001 kg)(9.8 m/s^2)}{\cos 20^\circ} = 0.0104 N$

Substituting value into the x-equation

$F_{elec} = T\sin\Theta = (1.04 \times 10^{-2} N)\sin 20^\circ = 0.0036 N$

b) The tension in the string is 0.0104 N