Assignment 4

(Dynamics)

Exercise 1:

In the system shown in Figure 1, a horizontal force $\overrightarrow{F_x}$ acts on an object of mass m_2=8.00kg. The horizontal surface is frictionless. Consider the acceleration of the sliding object as a function of F_x.

a. For what values of F_x does the object of mass m_1 =2.00 kg accelerate upward?

b. For what values of F_x is the tension in the cord zero?

c. Plot the acceleration of the m_2 object versus F_x. Include values of F_x from -100 N to +100 N.
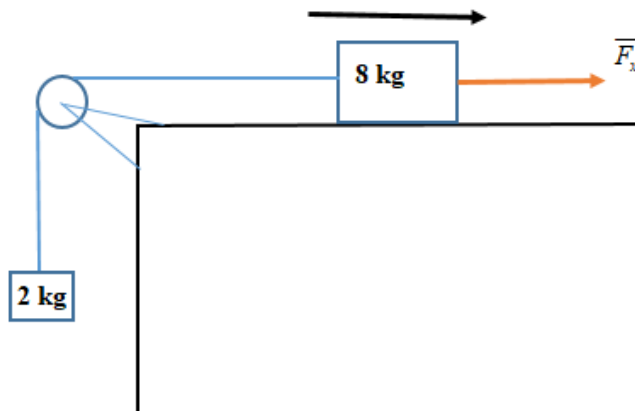

Figure 1

Exercise 2:

consider a 72.0 kg man standing on a spring scale in an elevator. Starting from rest, the elevator ascends, attaining its maximum speed of 1.20 m/s in 0.800s. It travels with this constant speed for the next 5.00s. The elevator then undergoes a uniform acceleration in the negative y direction for 1.50s and comes to rest. What does the spring scale register?

a. before the elevator starts to move,

b. during the first 0.80 s,

c. while the elevator is traveling at constant speed,
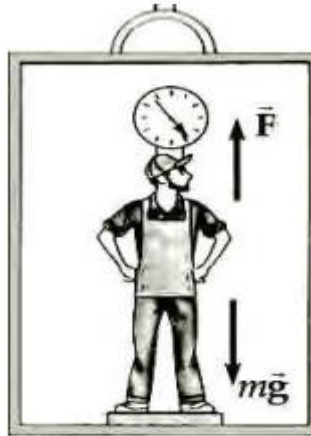
d. during the time interval it is slowing down?

Figure 2

Exercise 3:

The masses m_A and m_B slide on the smooth (frictionless) inclines fixed as shown in Figure 4.

a. Determine a formula for the acceleration of the system in terms of $m_A, m_B, \theta_A, \theta_B$ and g.

b. If $\theta_A=32°$, $\theta_B=23°$, $m_A=5.0$ kg what value of m_B would keep the system at rest? What would be the tension in the cord (negligible mass) in this case?

c. (c) What ratio m_A / m_B, would allow the masses to move at constant speed along their ramps in either direction?
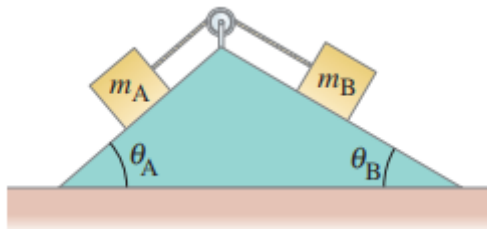

Figure 3

Exercise 4:

The two blocks are to be accelerated up the incline by means of an applied force $\vec{F}$ without having the small block slip. The coefficient of static friction between the two blocks is μ_s, but there is no friction between the larger block and the plane. We wish to find the maximum value of the force $\vec{F}$ that will maintain the nonslipping condition.
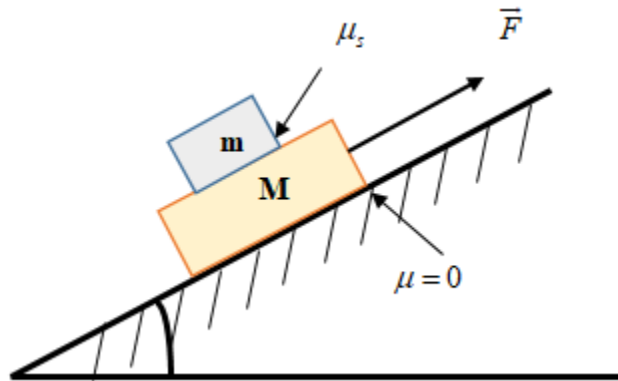

Figure 4