Name: _____ September 27, 2011

PHYS2325-02 MID TERM EXAM N.1

Question 1

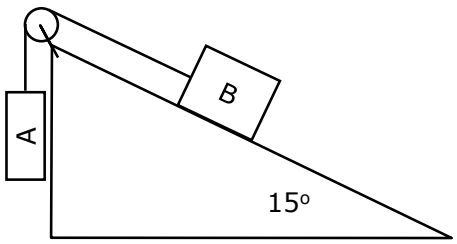
A system is made of two blocks, A and B, connected by a massless rope and placed on a incline as sketched in the figure. The pulley is massless and its motion is without friction. Instead, between the blocks and the incline there is a friction of coefficients $\mu_s = 0.3$ and $\mu_k = 0.15$. The masses are $m_A = 2$ kg and $m_B = 6$ kg. Knowing that the system initially has a speed of 1.5 m/s down the incline and the block B starts at 80 cm from the top of the slope, find the motion of block B.

Does the system stop its motion? If yes find the position of block B when its speed is zero. If not, find the time at which block B is at the point 2.2 m from the top of the slope.

If the system is initially at rest, does it start to move? If yes find the motion and tell in which direction block B moves. If not find the tension of the rope.

The following criteria are used to assess your work:

- (4 pts) Drawing and sketches of forces and reference systems
- (2 pts) Newton's second law writing
- (4 pts) Acceleration of the system
- (3 pts) Block B motion
- (2 pts) Answer to the first question
- (2 pts) Answer to the second question

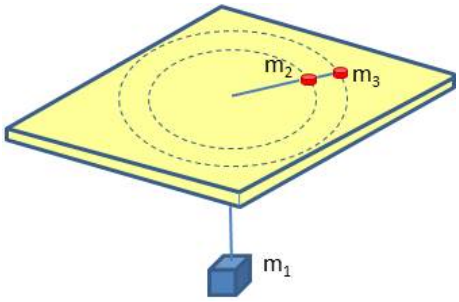


Question 2

Two air pucks of masses $m_2 = 120$ g and $m_3 = 60$ g are tied to a string and allowed to revolve in circles of radii $R_2 = 0.7$ m and $R_3 = 0.9$ m on a frictionless horizontal table. The other end of the string passes through a hole in the center of the table, and a counterweight of mass $m_1 = 90$ g is tied to it (see figure). The suspended object remains in equilibrium while the pucks on the tabletop revolve. Find the speed of the two pucks and the two tensions of the string. What will be the initial motion of the two pucks if the string between them is suddenly cut?

The following criteria are used to assess your work:

- (4 pts) Drawing and sketches of forces and reference systems
- (2 pts) Newton's second law writing
- (2 pts) Tensions of the string
- (2 pts) Speed of the two pucks
- (2 pts) Answer to the final question



Question 3

An object is moving at constant speed along a circular track. Explain how it is possible to describe the motion of that object along the track and write the motion of that object.

Why does the centripetal acceleration is equal to v^2/R, where v and R are respectively the object's speed and the radius of the circle?

How does the acceleration vector $\vec{a}$ change if the motion is constantly decelerating?