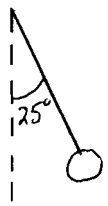
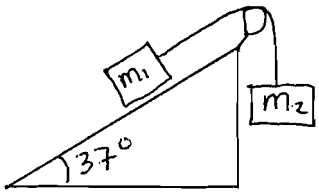
Ph 201H/211H
F08 Homework – Due Monday, October 27

1. In order to estimate the takeoff speed of an airplane, you hang your watch from a piece of string while the plane is at rest on the runway. As the plane begins to increase its velocity at a uniform rate, the string deflects at an angle of 25° and remains at that deflection for 18 seconds at which time the plane takes off. From this information, find the takeoff speed of the airplane.




2. You are given a spring and a 2.5-kg mass. When you hang the mass from the spring, you observe that the length of the spring increases by 4.8 cm. (a) What is the stiffness constant of the spring? (b) Holding the spring with the weight hanging from it, you step into an elevator. The elevator starts from rest and gains an upward speed of 1.6 m/s in a time of 0.75 s. Relative to its relaxed length, by how much does the length of the spring increase?

3. A block with mass $m_1$ = 12.0 kg rests on a frictionless surface inclined at an angle of $\theta$ = 37° with the horizontal. An ideal string passes over a frictionless pulley of negligible mass and is attached to a block of mass $m_2$. (a) Find the value of $m_2$ if the system remains at rest. (b) If $m_2$ = 9.6 kg, find the velocity of block 1 at a time of 1.2 s after it is released from rest.




4. Strings are attached to blocks A and B. Block B (mass 5.8 kg) hangs freely while block A (mass 8.2 kg) is on a horizontal surface on which there is a horizontal frictional force. The two strings are knotted together and ties to a third string, which makes an angle of 32° with the horizontal and is attached to a fixed wall. Find the frictional force in order for the entire system to remain at rest. [Hint: Consider the forces that act on 3 objects in this system – the two blocks and the knot.]