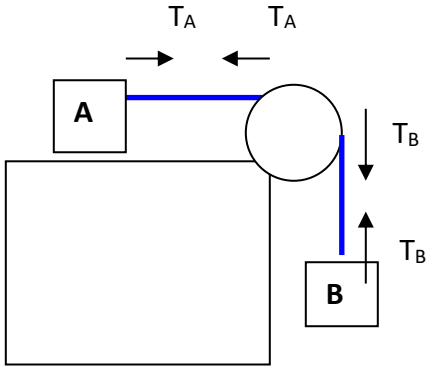
Lecture of Monday 3 December 2018

Multiple-Choice

1. A 3.00-kg ball swings rapidly in a complete vertical circle of radius 2.00 m by a light string. The ball moves so fast that the string is always taut. As the ball swings from its lowest point to its highest point:
   a) The work done on it by gravity is -118 J and the work done on it by the tension in the string is +118 J.
   b) The work done on it by gravity is -118 J and the work done on it by the tension in the string is zero. The work done on it by gravity is +118 J and the work done on it by the tension in the string is -118 J.
   c) The work done on it by gravity and the work done on it by the tension in the string are both equal to -118 J.
   d) The work done on it by gravity is -118 J and the work done on it by the tension in the string is zero.
   e) The work done on it by gravity and the work done on it by the tension in the string are both equal to zero.

Problem 1

2. Below Box A (m_A = 3 kg) lies on a **frictionless table** attached to box B through a cylindrical pulley of radius 0.2 m and mass 2 kg ($I = 0.5\ M\ r^2$).

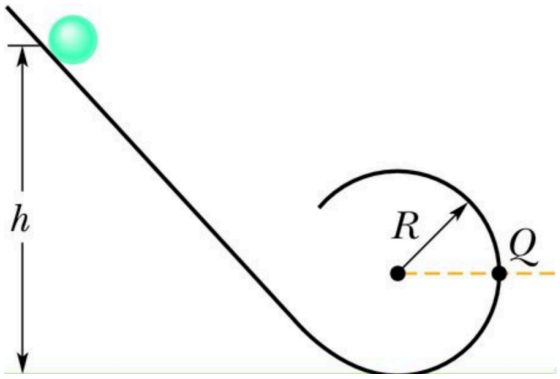


Box B is **accelerating downward**. At the same time the rope is inducing a **rotation** of the pulley **without slipping**. In order for this to happen, it should be clear that $T_B > T_A$, so that there is a net torque that induces a CW angular acceleration, α.

Find acceleration and tension:

Problem 2

In figure ball is 0.5 kg with radius of 2 cm; R = 0.3 m, h = 1.5 m. Find the normal force on the ball at the top, bottom, and point Q of the loop-to-loop.



Chapter 11, Problem 054

The figure shows an overhead view of a ring that can rotate about its center like a merry-go-round. Its outer radius R_2 is 1.0 m, its inner radius R_1 is $R_2/2$, its mass M is 8.6 kg, and the mass of the crossbars at its center is negligible. It initially rotates at an angular speed of 6.4 rad/s with a cat of mass $m = M/4$ on its outer edge, at radius R_2. By how much does the cat increase the kinetic energy of the cat-ring system if the cat crawls to the inner edge, at radius R_1?