Angular Momentum WS 1

1. A 10 kg disk of radius 3 meters is spinning at 15 radians per second. $I = \frac{1}{2}mr^2$
   a. What is the rotational inertia of the disk?

   b. Calculate the angular momentum of the disk. $L = IW$

   c. What is the unit for angular momentum?

2. The angular momentum of a rod changes from 15 to 35 kg*m^2/s in 4 seconds. What is the average net torque acting on the rod?

   Hints: Angular Impulse = Change in Angular Momentum

   Net Torque x Time = I(Wf – Wi)

3. A force of 300 N acts perpendicularly on the end of a 2.5 meter long pivoting rod initially at rest and with mass 10 kg. $I = (1/3)mL^2$
   a. What is the torque acting on the rod?

   b. What is the final angular momentum of the rod if the force acts on it for 8 seconds?

   c. What is the final angular speed?

   d. How much work was done by the force?

4. A 500 kg merry-go round with a radius of 10 meters is moving at a speed of .5 radians per second. A 40 kg child jumps on the merry-go-round at a position of 4 meters away from the center of the rotation.
   a. What is the rotational inertia of the merry-go-round?

   b. What is the rotational inertia of the child?

   c. What is the final speed of the merry-go-round after the child jumps on?

5. A bullet and door comprise a system. The bullet strikes the door perpendicularly and embeds itself in the door's edge at a distance 1.1 meters from the hinges. The mass of the bullet is .01 kg and it was traveling at velocity 400 m/s before striking the door. The door is initially at rest, has mass 13 kg and width 1.1 meters. The moment of inertia formula for a door is I = 1/3mr^2 where r is the door width.
   a. What is the moment of inertia of the door before the bullet is embedded?

   b. What is the moment of inertia of the door after the bullet is embedded?

   c. What is the initial angular momentum of the system? L= mvr sin(theta)

   d. What is the final angular velocity of the door?