Exam #3: Rotational Motion

Name: _____

1) A film projector has two spools, the back has twice the radius as the first. Film moves from the back to the front spool. If the back spool rotates at an angular velocity ω_0, what is the angular velocity of the front spool?

2) As car tires (of radius 20 cm and mass of 20 kg) enter water they begin to slow down. Assume that the deceleration is constant. If the car was initially moving at 40 mph and the car slowed to 35 mph after driving through a long stretched of water covered road for 15 s.

a. Find the angular acceleration of the tires.

b. Find the torque on the tires due to the water.

3) A rolling pin is approximately a cylinder. If it has a mass of 2.6 kg and a radius of 6.5 cm and it is rolled across some dough with an angular speed of 12 rev/s *without slipping*, answer the following:

a. How much kinetic energy is in the rolling motion of the pin?

b. How much kinetic energy is in the linear motion of the rolling pin?

c. What is the total kinetic energy of the rolling pin?

4) A solid sphere is rolled down an incline of height 35 cm. This incline is on a table of height 1.2 m. Find the distance from the table that the ball lands after it rolls down the incline and off of the table.

5) Find the center of mass of system of three point particles each with a different mass, m_1, m_2, and m_3. The distance between 1 and 2 is L_1 and the distance between 2 and 3 is L_2. Define ℓ as the distance between m_1 and then center of mass of the system.