Newton's 2nd Law for Rotating Bodies
(Rotational Dynamics) Name:_____

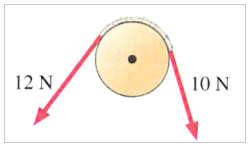
1. A small grinding wheel has a moment of inertia of 4.0×10^{-5} kg*m^2. What net torque must be applied to the wheel for its angular acceleration to be 150 rad/s^2?

2. While sitting in a swivel chair, you push against the floor with your heel to make the chair spin. The 7.0 N frictional force is applied at a point 40.0 cm away from the chair's rotational axis, in the direction that causes the greatest angular acceleration. If that angular acceleration is 1.8 rad/s^2, what is the total moment of inertia about the axis of you and the chair?

3. An object's moment of inertia is 2.0 kg*m^2. Its angular velocity is increasing at the rate of 4.0 rad/s per second. What is the net torque on the object?

4. A 200.0 g, 20.0 cm diameter plastic disk is spun on an axle through its center by an electric motor. What torque must the motor supply to take the disk from 0 to 1800 rpm in 4.0 s?

5. A frictionless pulley, which can be modeled as a 0.80 kg solid cylinder with a 0.30 m radius, has a rope going over it as shown in the figure below. The tension in the rope is 10.0 N on one side and 12.0 N on the other. What is the angular acceleration of the pulley?



6. A 5.0 cm diameter toy top has a moment of inertia of 3.0×10^{-5} kg*m^2 about its rotational axis. To get the top spinning, its string is pulled with a tension of 0.30 N. How long does it take for the top to complete the first five revolutions? (The string is long enough that it is wrapped around the top more than five turns.)

Bonus:
A 1.5 kg block and a 2.5 kg block are attached to opposite ends of a light rope. The rope hangs over a solid, frictionless pulley that is 30.0 cm in diameter and has a mass of 0.75 kg. What is the linear acceleration of the lighter block?