Name: Hr: AP PhyC S2 WS1

*To be submitted*

# *Rotation I*

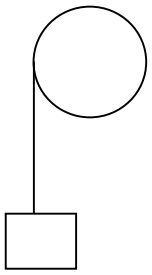
1. The flywheel (r = 40 cm) on an exercise bike is uniformly sped up from 80 rpm's to 115 rpm's in 5 seconds.
   a. What is the angular acceleration of the flywheel?
   b. Through what angle does the flywheel rotate?
   c. What is the final linear speed of the outside edge of the flywheel?

2. A charged particle in varying electric and magnetic fields travels in a circle with a radius of 50 meters so its angular position from the start is given by the function: $\theta = 15t^3 + 6t^2$.
   a. What is the angular velocity as a function of time?
   b. Where in the circle is the particle at 4 sec?
   c. What is the linear velocity at 4 sec?
   d. What is the angular acceleration at 4 sec?
   e. What are the linear components of acceleration at 4 sec?

3. A solid sphere ( m = 5 kg, r = 0.7 m) starts at rest. A force of 5 N is applied tangentially to the outer edge of the sphere.
   a. What is the moment of inertia of the sphere?
   b. What is the torque on the sphere?
   c. What is the angular acceleration of the sphere?
   d. What is the linear velocity of the outer edge of the sphere after 3 seconds?

4. Explain the advantage of each of the following tools using rotation arguments:
   a. a hammer.
   b. a wrench.
   c. a screwdriver

5. A 3.0 kg box is attached to a solid disc as shown. The disc has a mass of 2.0 kg and a radius of 0.3 meters. When the block is released from rest, find:
   a. the angular acceleration of the disc.
   b. the linear acceleration of the block.
   c. the tension in the rope.



6. A solid disc (m = 4 kg and r = 0.3 m) is used for a gyroscope. A 3 meter string is wrapped around the outer edge of the disc. A constant force of 10 N is applied to the string to get the disc rotating.
   a. What is the angular acceleration of the disc?
   b. Through what angle will the disc move while the rope is attached?
   c. What is the final kinetic energy of the disc?