Worksheet 15: Rotational Kinematics

1. A particle moves in a circular path of radius r.
   a. What is its angular displacement θ after 2.0 complete rotations?

   b. What is its path length s after 2.0 complete rotations?

   c. If it takes time t to complete 2.0 rotations, what is its average tangential speed v?

   d. If it takes time t to complete 2.0 rotations, what is its average angular speed ω?

2. A centrifuge rotor accelerates from 2500 rpm to 3500 rpm in 35 seconds.
   a. What are its initial and final angular speeds ω_1 and ω_2 in rad/s?

   b. What is its angular acceleration α in rad/s^2?

   c. What was its angular displacement $\Delta\theta$ during that time, in radians?

3. A bicycle with wheels of radius 34.5 cm rolls at a speed of 10.0 m/s.
   a. What is the angular speed ω of the wheels?

   b. The bicycle slows to a stop in 4.0 s. What is the angular acceleration α of the wheels during that time?

c. The bicycle travels 20.0 m while stopping. How many radians did the wheels turn in that time?

4. A solid sphere with radius 7.50 cm and a mass of 13.2 kg rolls without slipping at a translational speed of 2.25 m/s.

   a. What is its rotational speed?

   b. What is its translational kinetic energy?

   c. What is its moment of inertia?

   d. What is its rotational kinetic energy?

   e. What is its total kinetic energy?