AP Physics C
Review Chapter 8 Rotational Motion I

1. The angular velocity of a rotating disk increases from 2 rad/s to 5 rad/s in ½ sec.
   a. What is the disk's average angular acceleration?

2. A disk of radius 20 cm rotates at a constant angular velocity of 6 rad/s. How fast does a point on the rim of this disk travel (in m/s)?

3. The angular velocity of a rotating disk of radius 50 cm increases from 2 rad/s to 5 rad/s in 0.5 s. What is the linear acceleration of a point on the rim of the disk during this time interval?

4. Starting from rest, a sphere begins to spin with constant angular acceleration about an axis through its center, achieving an angular velocity of 10 rad/s when its angular displacement is 20 rad. What is the value of the sphere's angular acceleration?

5. A fan blade spins at the rate of 94 rad/s. The blade is 20 cm long.
   a. What is the tangential speed of the fan blade?
   b. Through what angular distance does it turn in 5 sec?
   c. Through what tangential distance does it turn in 5 sec?

6. Calculate the angular velocity of
   a. The second hand
   b. The minute hand
   c. The hour hand of a clock in rad/s
   d. What is the angular acceleration in each case?

7. What is the linear speed of a point
   a. On the equator?
   b. On the Arctic Circle (latitude 66.5°, N)
   c. In Olympia, WA (latitude 46°, N)

8. A 70-cm diameter wheel accelerates uniformly from 160 rpm to 280 rpm in 4 s. Determine
   a. Its angular acceleration
   b. Radial and tangential components of the linear acceleration of a point on the edge of the wheel 2.0 s after it has started accelerating.

9. An automobile engine slows down from 4000 rpm to 1200 rpm in 3.5 s. Calculate
   a. Its angular acceleration, assumed uniform
   b. The total number of revolutions the engine make in this time.

10. A 40-cm-diameter wheel accelerates uniformly from 240 rpm to 360 rpm in 6.5 s. How far will a point on the edge of the wheel have traveled in this time?

11. A small rubber wheel is used to drive a large pottery wheel, and they are mounted so that their circular edges touch. If the small wheel has a radius of 2.0 cm and accelerates at the rate of 7.2 rad/s^2, and it is in contact with the pottery wheel (radius 25.0 cm) without slipping, calculate
    a. The angular acceleration of the pottery wheel
    b. The time it takes the pottery wheel to reach its required speed of 65 rpm.

12. Calculate the moment of inertia of a 12.2-kg sphere of radius 0.623 m when the axis of rotation is through its center.

13. Calculate the moment of inertia of a 66.7-cm-diameter bicycle wheel. The rim and tire have a combined mass of 1.25 kg. The mass of the hub can be ignored (why?)