AP Physics 1
M. Lam   <u>Rotational Kinematics</u>

1. A top is on a horizontal table spinning counterclockwise. It is also moving to the right with a linear speed v. What is the direction of the angular velocity?

2. A car is moving along a horizontal road at a constant velocity that is directed 45° south of east. What is the direction of the angular velocity of the wheels of the car?

3. A wheel with a 0.10 m radius is rotating at 35 rev/s. It then slows uniformly to 15 rev/s over a 3.0 s interval. What is the angular acceleration of a point on the wheel?

4. During the spin-dry cycle of a washing machine, the motor slows from 95 rad/s to 30. rad/s while turning the drum through an angle of 402 radians. What is the magnitude of the angular acceleration of the motor?

5. An airplane engine starts from rest. 2.0 seconds later, it is rotating with an angular speed of 350 rev/min. If the angular acceleration is constant, how many revolutions does the propeller undergo during this time?

6. The original Ferris wheel has a radius of 38 m and completed a full revolution every two minutes when operating at its maximum speed. If the wheel were uniformly slowed from its maximum speed to a stop in 35 seconds, what would be the angular acceleration of the wheel?

7. A grindstone of radius 4.0 m is initially spinning with an angular speed of 8.0 rad/s. The angular speed is then increased to 10.0 rad/s over the next 4.0 seconds. Assume that the angular acceleration is constant.
    a) What is the average angular speed of the grindstone?
    b) What is the magnitude of the angular acceleration of the grindstone?
    c) Through how many revolutions does the grindstone turn during the 4.0 second interval?

8. What is the tangential speed of a lug nut on a wheel of a car if the lug nut is located 0.114 m from the axis of rotation and the wheel is rotating at 6.53 rev/s?

9. What is the tangential speed of Nairobi, Kenya, a city near the equator? The earth makes one revolution every 23.93 h and has an equatorial radius of 6380 km.

10. On an amusement park ride, passengers are seated in a horizontal circle of radius 7.5 m. The seats begin from rest and are uniformly accelerated for 21 seconds to a maximum rotational speed of 1.4 rad/s. What is the instantaneous tangential speed of the passengers 15 s after the acceleration begins?