Homework

1. A propeller (arm length 1.2 m) starts from rest and begins to rotate counterclockwise with a constant angular acceleration of size 2.7 rad/s².

a. How long does it take for the propeller's angular speed to reach 5.7 rad/s?

b. How many revolutions does it take for the propeller's angular speed to reach 5.7 rad/s?

c. What is the linear speed of the tip of the propeller at 5.7 rad/s?

d. What is the linear acceleration of the tip of the propeller at this point?

e. What is the centripetal acceleration of the tip of the propeller at this point?
2. A potter's wheel moves from rest to an angular speed of 0.20 rev/s in 30 s. Find its angular acceleration in radians per second per second.
3. A dentist's drill starts from rest. After 3.20 s of constant angular acceleration, it turns at a rate of $2.51 \times 10^4 \text{ rev/min}$. (a) Find the drill's angular acceleration. (b) Determine the angle (in radians) through which the drill rotates during this period.
4. A certain light truck can go around a flat curve having a radius of 150 m with a maximum speed of 32.0 m/s. With what maximum speed can it go around a curve having a radius of 75.0 m?
5. A drill bit rotating at 3600 rev/min rotates through 50 revolutions while coming to rest. Find the drill's angular acceleration.
6. A boy swings a 15.7 kg stone in a horizontal circle with a radius of 0.98 m. The string breaks under 370 N of tension. What is the maximum speed (in m/s) the stone can have?
7. A wheel has a constant angular acceleration of 3.0 rad/s\(^2\). During a certain 2.0 s interval, it turns through an angle of 614 revolutions. Assuming that the wheel started from rest, how long has it been in motion at the start of this 2.0 s interval?
8. A sample of blood is placed in a centrifuge of radius 15.0 cm. The mass of a red blood cell is $3.0 \times 10^{-16}$ kg, and the magnitude of the force acting on it as it settles out of the plasma is $4.0 \times 10^{-11}$ N. At how many revolutions per second should the centrifuge be operated?