3.8 • A bicycle wheel has an initial angular velocity of $1.50 \text{ rad/s}$. (a) If its angular acceleration is constant and equal to $0.300 \text{ rad/s}^2$, what is its angular velocity at $t = 2.50 \text{ s}$? (b) Through what angle has the wheel turned between $t = 0$ and $t = 2.50 \text{ s}$?

5.10 • An electric fan is turned off, and its angular velocity decreases uniformly from 500 rev/min to 200 rev/min in 4.00 s. (a) Find the angular acceleration in rev/s$^2$ and the number of revolutions made by the motor in the 4.00-s interval. (b) How many more seconds are required for the fan to come to rest if the angular acceleration remains constant at the value calculated in part (a)?

5.16 • At $t = 0$ a grinding wheel has an angular velocity of 24.0 rad/s. It has a constant angular acceleration of 30.0 rad/s$^2$ until a circuit breaker trips at $t = 2.00 \text{ s}$. From then on, it turns through 432 rad as it coasts to a stop at constant angular acceleration. (a) Through what total angle did the wheel turn between $t = 0$ and the time it stopped? (b) At what time did it stop? (c) What was its acceleration as it slowed down?

5.39 • A uniform sphere with mass $28.0 \text{ kg}$ and radius $0.380 \text{ m}$ is rotating at constant angular velocity about a stationary axis that lies along a diameter of the sphere. If the kinetic energy of the sphere is $176 \text{ J}$, what is the tangential velocity of a point on the rim of the sphere?

8.45 • Energy is to be stored in a $70.0-\text{ kg}$ flywheel in the shape of a uniform solid disk with radius $R = 1.20 \text{ m}$. To prevent structural failure of the flywheel, the maximum allowed radial acceleration of a point on its rim is $3500 \text{ m/s}^2$. What is the maximum kinetic energy that can be stored in the flywheel?

11.3 • The pulley in Fig. P9.84 has radius $0.160 \text{ m}$ and moment of inertia $0.560 \text{ kg} \cdot \text{m}^2$. The rope does not slip on the pulley rim. Use energy methods to calculate the speed of the 4.00-kg block just before it strikes the floor.

11.9 • You hang a thin hoop with radius $R$ from a rod at the right angle to the horizontal. (a) Determine the tension in the string upon which the hoop is hanging. (b) From its equilibrium position and from the right end of the beam should support $B$ be placed so that the boy can walk just to the end of the beam without causing it to tip?

11.18 • Find the tension $T$ in each cable and the magnitude and direction of the force exerted on the strut by the pivot in each of the cases shown in Fig. E11.13. In each case let $w$ be the weight of the suspended crate full of priceless art objects. The strut is uniform and also has weight $w$. Start each case with a free-body diagram of the strut.

11.18 • A 15,000-N crane pivots around a friction-free axle at its base and is supported by a cable making a $25^\circ$ angle with the crane (Fig. E11.18). The crane is 16 m long and is not uniform, its center of gravity being 7.0 m from the axle as measured along the crane. The crane is raised to $55^\circ$ above the horizontal holding an 11,000-N pallet of bricks by a 2.2-m, very light cord, find (a) the tension in the cable and (b) the horizontal and vertical components of the force that the axle exerts on the crane. Start with a free-body diagram of the crane.

11.70 • One end of a uniform meter stick is placed against a vertical wall (Fig. P11.70). The other end is held by a lightweight cord that makes an angle $\theta$ with the stick. The coefficient of static friction between the end of the meter stick and the wall is 0.40. (a) What is the maximum value the angle $\theta$ can have if the stick is to remain in equilibrium? (b) Let the angle $\theta$ be $15^\circ$. A block of the same weight as the meter stick is suspended from the stick, as shown, at a distance $x$ from the wall. What is the minimum value of $x$ for which the stick will remain in equilibrium? (c) When $\theta = 15^\circ$, find $x$.

5/1 A torque applied to a flywheel causes it to accelerate uniformly from a speed of 300 rev/min to a speed of 900 rev/min in 6 seconds. Determine the number of revolutions $N$ through which the wheel turns during this interval. (Suggestion: Use revolutions and minutes for units in your calculations.)

Ans. $N = 60 \text{ rev}$

5/5 The angular velocity of a gear is controlled according to $\omega = 12 - 3\theta$ where $\omega$, in radians per second, is positive in the clockwise sense and where $\theta$ is the time in seconds. Find the net angular displacement $\Delta \theta$ from the time $t = 0$ to $t = 3 \text{ s}$. Also find the total number of revolutions $N$ through which the gear turns during the 3 seconds.

Ans. $\Delta \theta = 9 \text{ rad}$, $N = 3.66 \text{ rev}$