

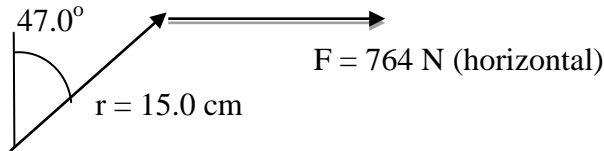
Name \_\_\_\_\_

Holiday movie you watch every year with your family \_\_\_\_\_

**Show your work, and circle your answers and use sig figs to receive full credit.**

I (about centers): cylinder =  $\frac{1}{2}mr^2$ , ring/point =  $mr^2$ , sphere =  $\frac{2}{5}mr^2$ , rod =  $\frac{1}{12}mL^2$  (=  $\frac{1}{3}mL^2$  about end)

1. Calculate the torque here (Be careful what you use for the angle)



2. What is the torque needed to accelerate a bicycle wheel with a moment of inertia of  $0.248 \text{ kg m}^2$  at  $45.1 \text{ rad/s}^2$ ?

3. A  $0.740 \text{ m}$  diameter (different) bicycle wheel is a thin ring with a mass of  $3.20 \text{ kg}$ . If it is initially spinning at  $54.0 \text{ rad/s}$ , and stops after going around  $67.2$  times, what is the frictional torque acting?

4. A flywheel that is a  $0.280 \text{ m}$  diameter cylinder with a mass of  $37.0 \text{ kg}$  would require what torque to accelerate from rest to  $4510 \text{ RPM}$  in  $2.10$  seconds? What force must be exerted at the edge of the flywheel to effect this?

5. What tangential force is needed to accelerate a (cylindrical)  $292 \text{ kg}$  merry go round with a diameter of  $3.80 \text{ m}$  from rest to  $1.80$  rotations per second in  $8.00$  rotations?