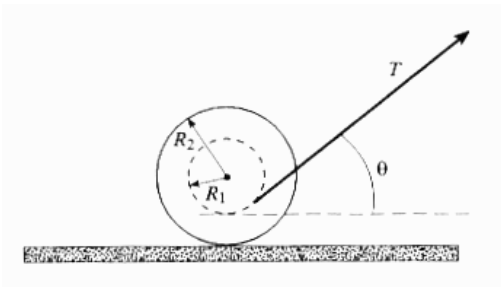


Reading: Chapter 5

Problems:

1. Goldstein, Problem 5-3.
2. Goldstein, Problem 5-17.
3. Goldstein, Problem 5-24.
4. A spool rests on a rough table as shown. A thread wound on the spool is pulled with force  $T$  at angle  $\theta$ . (a) If  $\theta = 0$ , will the spool move to the left or right? (b) Show that there is an angle  $\theta$  for which the spool remains at rest. (c) At this critical angle find the maximum  $T$  for equilibrium to be maintained. Assume a coefficient of friction  $\mu$ .



5. A heavy axially symmetric gyroscope is supported at a pivot, as shown. The mass of the gyroscope is  $M$ , and the moment of inertia about its symmetry axis is  $I$ . The initial angular velocity about its symmetry axis is  $\omega$ . Give a suitable approximate equation of motion for the system, assuming that  $\omega$  is very large. Find the angular frequency of the gyroscopic precession. Show that the above approximation is justified for  $\omega \gg \sqrt{g/l}$ , where all moments of inertia are taken to be roughly  $M l^2$ .

