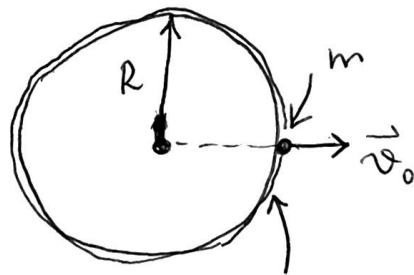


Midterm (2022)

- ① a point mass m is attached to a weightless cord wound around a stationary cylinder of radius R . Initially the cord is completely wound up and the mass touches the cylinder. At $t=0$, the mass is given the initial velocity v_0 in the radial direction, away from the cylinder's surface:



cord wound around the cylinder (many turns)

Assume no external forces; note that the cylinder does not rotate, its position is fixed.

- Find the EoM in terms of a suitably chosen generalized coordinate.
- Solve the EoM with the initial conditions described above.

(c) Find the angular momentum
 l about the cylinder axis.

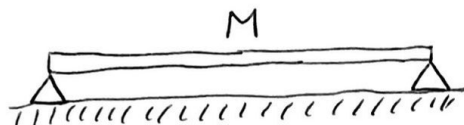
2. a mass m moves in a circular orbit of radius r_0 under the influence of the force with potential $V(r) = -\frac{km}{r^n}$ ($k > 0$ is a constant)

20 pt

Find the range of n ~~where~~ for which the circular orbit is stable under small oscillations. (small deviations from the circle)

3. a uniform thin rigid rod of
and length L ,
mass M is supported at the
ends as shown:

20 pt



at $t=0$, the right support is
kicked out. Find the force on the
left support immediately afterwards.

Hint: $I = \frac{1}{3} ML^2$ for a thin rod
rotating around its end

