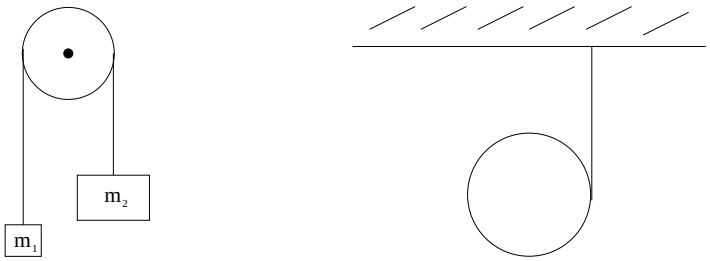
Physics 3344 **Professor Scalise**
Spring 2000 **Assignment #1**

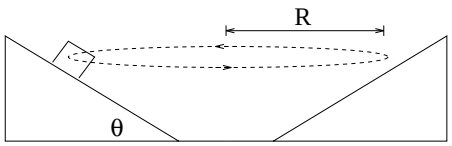
Review of Introductory Mechanics (Due: 25 January 2000)

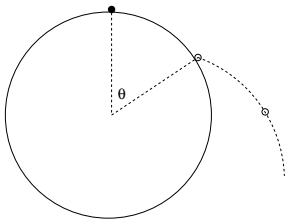
1. An Atwood machine consists of two masses $m_1 < m_2$ suspended over a massless, frictionless pulley by a light inextensible string. Find the acceleration of either mass and the tension in the string.

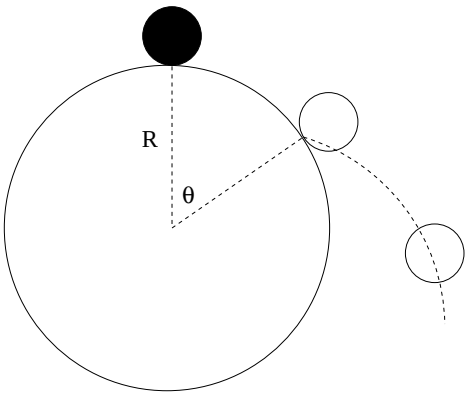


2. A light inextensible string is wrapped several times around a solid cylinder while the other end is fixed to the ceiling. As the spool falls, the string unwinds without slipping. Find the acceleration of its center of mass and the tension in the string.

3. Imagine that you are a civil engineer. You need to build a circular track of radius R inclined at an angle θ from the horizontal such that cars traveling at speed v will not slide even if the road surface is covered with ice (frictionless). Find the angle θ.





4. A point particle slides off a frictionless sphere starting from rest at the top $\theta = 0$. At what angle will the particle leave the surface of the sphere?

5. A small cylinder of radius r rolls without slipping on a sphere of radius $R \gg r$, starting from rest at the top $\theta = 0$. At what angle will the cylinder leave the surface of the sphere? (Neglect terms of order $\frac{r}{R}$.)