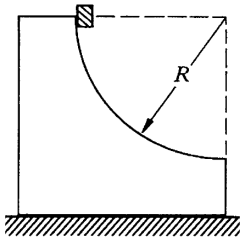
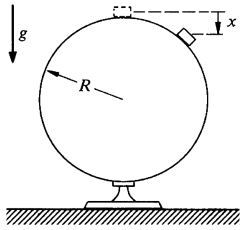
4.4 A small cube of mass m slides down a circular path of radius R cut into a large block of mass M, as shown at right. M rests on a table, and both blocks move without friction. The blocks are initially at rest, and m starts from the top of the path.



Find the velocity v of the cube as it leaves the block.

Ans. clue. If $m = M$, $v = \sqrt{gR}$

4.6 A small block slides from rest from the top of a frictionless sphere of radius R (see at right). How far below the top x does it lose contact with the sphere? The sphere does not move. *Ans.* $R/3$



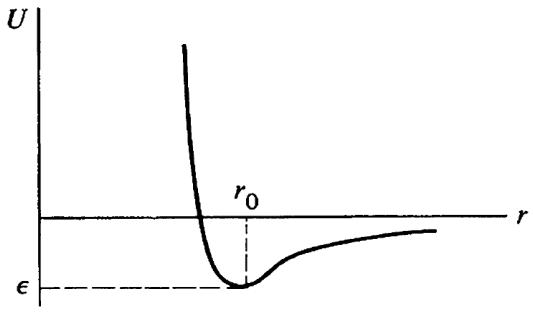
4.13 A commonly used potential energy function to describe the interaction between two atoms is the Lennard-Jones 6,12 potential

$$U = \epsilon\left[\left(\frac{r_0}{r}\right)^{12} - 2\left(\frac{r_0}{r}\right)^{6}\right].$$

a. Show that the radius at the potential minimum is r_0, and that the depth of the potential well is ϵ.

b. Find the frequency of small oscillations about equilibrium for 2 identical atoms of mass m bound to each other by the Lennard-Jones interaction.

Ans. $\omega = 12\sqrt{\epsilon/r_0^2 m}$



Practice problems for the students (not to be discussed in the Tutorial class)
4.7, 4.14, 4.20