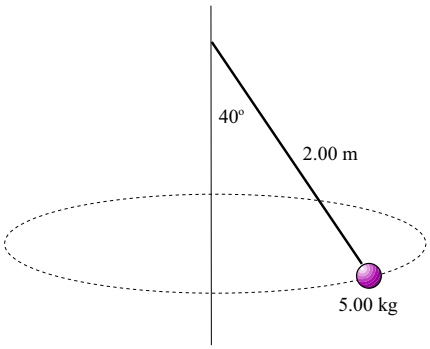
Name_____

Phys 2010 (NSCC), Fall 2007
Problem Set #6

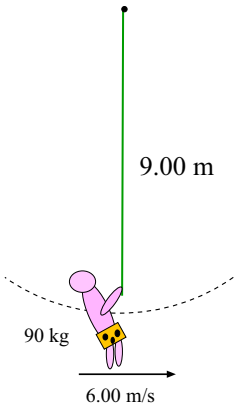
1. A 5.00 kg mass is swung in a horizontal circle at the end of a 2.00 m string which is inclined at 40.0° from the vertical.

Find the radius of the circle in the which the mass moves. By insuring that the vertical forces add to zero (there is no vertical acceleration) find the tension in the string.



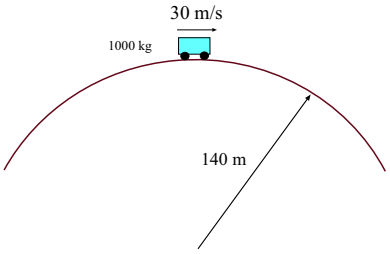
2. In problem 2, by setting the inward component of the force on the mass equal to mv^2/r, find the speed of the mass.

3. Tarzan (who has a mass of 90 kg) tries to cross a river by swinging from a 9.00–m long vine. His speed at the bottom of the swing is 6.0 $\frac{\text{m}}{\text{s}}$. Find the tension in the vine at this point.



4. A car of mass 1000 kg is traveling over the top of a hill at a speed of 30.0 $\frac{\text{m}}{\text{s}}$. The hill has a radius of curvature of 140 m.

What is the normal force of the road on the car? What is the maximum speed the car can have at the top of this hill for it to stay in contact with the road? (It loses contact if the normal force is zero at the top of the hill.)



5. Triton, a satellite of Neptune, has an orbital period of 5.877 days and an orbital radius of 3.548×10^8 m.

From these data (and the equations we found in class relating orbital period and radius) find the mass of Neptune.

6. At what distance from the earth (actually, the earth's *center*) is a satellite orbiting if it has a period of one day? (Use $M_E = 5.98 \times 10^{24}$ kg in getting your answer.)

Such satellites have been put in orbit and are known as geostationary satellites.

Express the answer as a multiple of the earth's radius.

7. If a 3.0 kg object has a kinetic energy of 11.0 J, what is its speed?

8. What is the kinetic energy of an electron moving at $\frac{1}{10}$ of the speed of light? Express the answer in eV. Use: $m_{\mathrm{e}} = 9.11 \times 10^{-31}$ kg, $v_{\mathrm{light}} = c = 2.998 \times 10^{8}\ \frac{\mathrm{m}}{\mathrm{s}}$, 1 eV $= 1.602 \times 10^{-19}$ J.