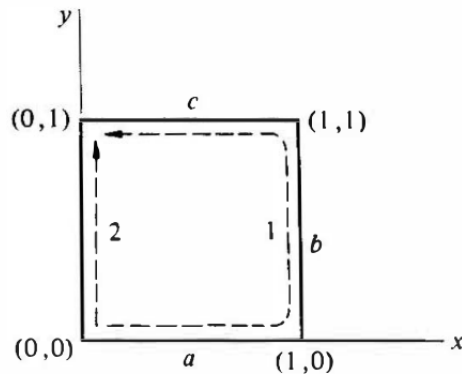




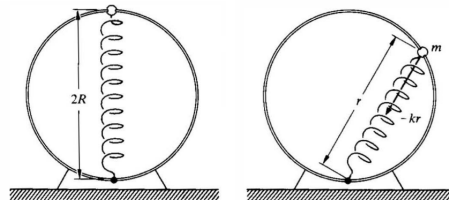
PH103 : Physics
Tutorial 4

1. Let $\vec{F} = A(xy\hat{i} + y^2\hat{j})$, and consider the integral from $(0,0)$ to $(0,1)$, first along path 1 and then along path 2, as shown in the figure. Find the work done in moving the particle along path 1 and path 2.



2. A bead of mass m slide without friction on a vertical hoop of radius R . The bead moves under the combined action of gravity and a spring attached to the bottom of the hoop. For simplicity, we assume that the equilibrium length of the spring is zero, so that the force due to the spring is $-kr$, where r is the instantaneous length of the spring as shown in the figure.

The bead is released at the top of the hoop with negligible speed. How fast is the bead moving at the bottom of the hoop ?



3. We know that the gravitational force is conservative since it possesses a potential energy function. Prove that the force of gravity is conservative by showing that its curl is zero.
4. A pendulum consists of a light rigid rod of length l , pivoted at one end, with mass m attached at the other end. The pendulum is released from rest angle ϕ_0 , as shown. What is the velocity of m when the rod is at an angle ϕ ? see figure given in the next page.

