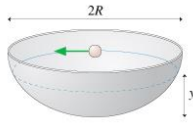1. A small ball rolls around a horizontal circle at height y inside a frictionless hemispherical bowl of radius R, as shown in the figure (Figure 1) with constant speed. Find the speed of the ball in terms of y, R, and g.

2. A block of mass m is at rest at the origin at $t = 0$. It is pushed with constant force F_0 from $x = 0$ to $x = L$ across a horizontal surface whose coefficient of kinetic friction is $\mu_k = \mu_0 (1 - x/L)$. Find the expression for the block's speed as it reaches position L.