A small point like object of mass $m$ rests on top of a sphere of radius $R$. The object is released from the top of the sphere with a negligible speed and it slowly starts to slide (see figure below) and $g$ is the magnitude of the gravitational acceleration. (a) Determine the angle $\theta_1$ with respect to the vertical at which the object will lose contact with the surface of the sphere. (b) What is the speed $v_1$ of the object at the instant it loses contact with the surface of the sphere.