

**50423, Physics, Mechanics — Kinematics — Dynamics**

**Question** A small disc is on the top of a hemisphere of radius  $R$ . What is the smallest horizontal velocity  $v$  that should be given to the disc for it to leave the hemisphere and not slide down it? [there is no friction] (1)  $\sqrt{2gR}$  (2)  $\sqrt{gR}$  (3)  $g/R$  (4)  $\sqrt{g^2R}$

**Solution** To leave the hemisphere disc has to have the radius of the curvature of trajectory bigger (at the top of the hemisphere), than radius of hemisphere. The formula for curvature at that point is

$$r = \frac{v^2}{g}$$

So, the minimum speed is when they are equal

$$R = \frac{v^2}{g}$$

Hence

$$v = \sqrt{gR}$$

Answer is (2)  $\sqrt{gR}$ .