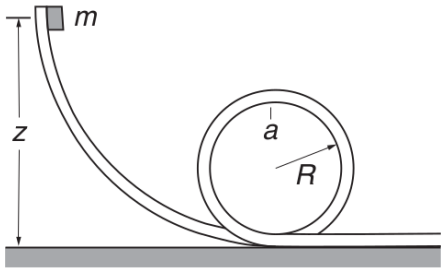
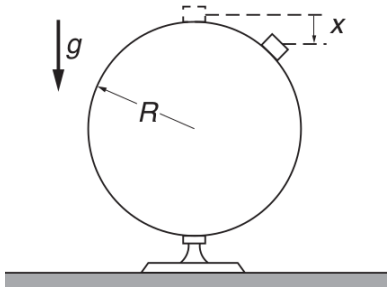
Tutorial 8 **Energy** 6 September 2024

P1.



A small block of mass m starts from rest and slides along a frictionless loop-the-loop as shown in the Fig.sketch on the next page. What should be the initial height z, so that m pushes against the top of the track (at a) with a force equal to its weight?

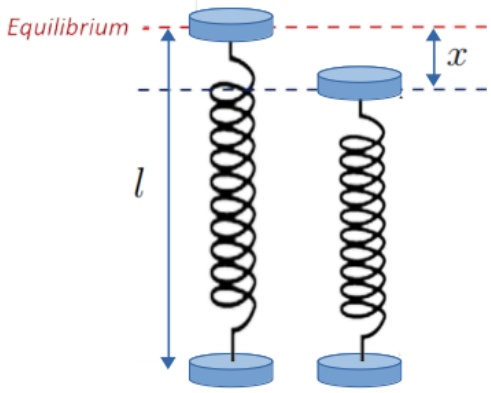
P2.



A small block slides from rest from the top of a frictionless sphere of radius R as shown Figure. How far below the top will the block loose contact with the surface of the sphere? Note the sphere does not move at all, and the acceleration due to gravity is g.

P3. Replace the small block (of P2) by a small sphere of mass m and radius r ($<< R$). The sphere starts rolling without slipping from the top of the sphere until it loses contact with the surface of the sphere. Find the height below the top of the sphere before which it loses contact. Is there any condition on the coefficient of friction μ between the small and the large sphere that must be satisfied for the sphere to roll without slipping throughout its contact with the larger sphere?

P4.



Consider two flat discs each of mass M whose centers are connected to the ends of a linear massless spring of unstretched length l and spring constant k. The discs are resting on top of each other, and the acceleration due to gravity is g. The top disc is depressed by a height x, and released from rest, while the bottom disc is resting on a level horizontal floor.

(a) Determine the minimum value of x so that subsequently the bottom disc is just able to rise from the floor.

(b) If the top disc is actually depressed by $2x$ (where x was determined in part (a), describe the subsequent motion of the two discs after the bottom disc lifts off from the floor.