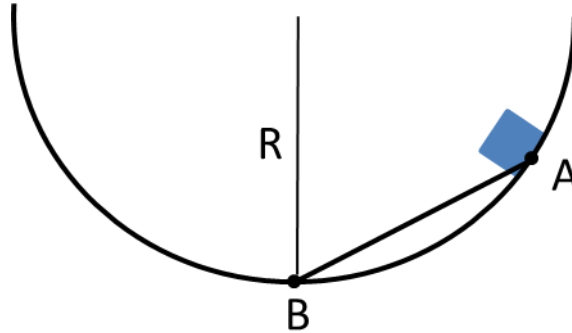
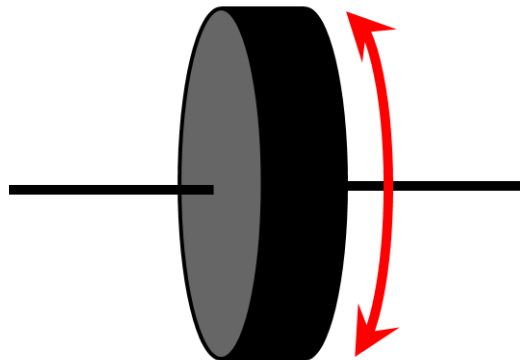


## Homework 19

1. An ice cube is placed in point A on the internal surface of a sphere with a radius  $R$  (see picture below). Find period of oscillations of the cube with respect to the lowest point B of the sphere. The length of arc AB is much less than radius  $R$ . There is no friction between the cube and the surface of the sphere. (*Hint: compare this system with a pendulum of length  $R$* ).



2. The length of the arc AB is definitely more than this of of straight segment AB. Is the sliding time along the arc AB longer than the sliding time along the plane AB (see Figure above)? Prove your answer.
3. A disc with a mass  $M$  and a radius  $R$  is fixed on an elastic axis which passes through the center of the disc and perpendicular to the disk plane. If we slightly turn the disk, say, clockwise in its plane and let it go, the disc will oscillate (these will be rotational oscillations, so the center of the disc does not displace). The magnitude of the restoring torque  $T$  is proportional to the turning angle  $\alpha$ :  $T = -K\alpha$ . Find the period of the disc's oscillations.



Just to remind: the moment of inertia of our disc is  $\frac{MR^2}{2}$ . (Hint: use “second Newton’s law” for the rotational motion).