USEFUL RESOURCES

TODAY'S MEETING

Today we solved most of the assigned problems on projectile motion. Problem 7 is reassigned.

REASSIGNED PROBLEMS

7. A fireman with a hose is standing at distance l away from an infinite vertical wall. Find the shape of the 2-dimensional region on the wall that he can reach with water from the hose. Water is coming out of the hose with speed v at height h above the ground.

NEW HOMEWORK

Our next topic is circular motion.

1. The distance from the Earth to the Sun is $1.5 \cdot 10^{11}$ meters. Find the orbital velocity of the Earth and its centripetal acceleration.

2. A small object is moving on a flat horizontal desk towards the edge with speed v. The edge is rounded into a shape of circle of radius r. What is the minimal v such that upon reaching the edge the object immediately starts moving along a parabolic trajectory?

3. A spherical reservoir of radius R stands on the ground. A rock is thrown from the ground level with initial speed v in such a way that it just touches the topmost point of the reservoir. What is the smallest possible v?

4. A wheel of radius r rolls without slipping on the internal surface of motionless a cylinder of radius $2r$. Find the trajectory of a particular point on the rim of the wheel.
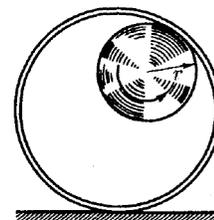
5. A rock thrown with initial velocity v_0 at angle α to the ground goes along a parabola. A bird flies along the same parabola with constant speed v_0. Find the acceleration of the bird at the highest point of the trajectory.

*6. A ball is rolling along the edge of a rectangular gutter ACB with speed v without slipping. Distance AB is equal to the radius of the ball. Which points on the ball have the maximal speed? What is this speed equal to?
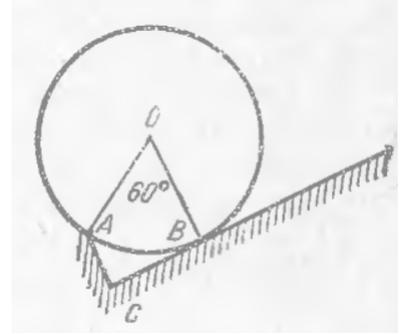
*7. Because of the finite exposure needed, in a side-on photograph of the front wheel of a moving bicycle, the spokes seem blurred. However, there will be some apparently sharp points in the picture. Where are these sharp points? For the sake of simplicity, suppose that the bicycle spokes are radial.

<p style="text-align:center">FOR THE NEXT MEETING</p>

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **October 29**.