ADVANCED PHYSICS CLUB
OCTOBER 29, 2023

Useful resources

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2023`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

Today we solved some of the assigned problems on circular motion. Problems 5,6 and 7 are reassigned.

Reassigned problems

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?
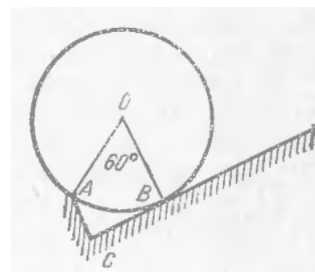

7 Because of the finite exposure needed, in a side-on photograph of the front wheel of a moving bicycle, the spokes seem blurred. However, there will be some apparently sharp points in the picture. Where are these sharp points? For the sake of simplicity, suppose that the bicycle spokes are radial.

New Homework

We finish with one final assignment on kinematics, problems on mixed topics.

1. A spherical tank of radius R is half-filled with water (see picture). It is known that in a unit time a volume q of water is evaporated per unit area of the waters surface. In what time will all of the water from the tank evaporate?
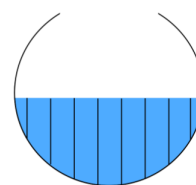
2. If an elastic ball hits a wall at rest at $90°$ its velocity switches direction to the opposite and speed stays the same. Consider a ball moving at speed v towards the wall which moves with speed u towards the ball. What will be speed of the ball after the collision? What if the wall moves away from the ball with speed $u < v$?

3. A boat is pulled with a rope in such a way that the rope is always under tension. The boat moves with velocity v which makes an angle α with the piece of the rope attached to it. With what speed is the free end of the rope pulled at this moment?

*4. A shooter is aiming at a circular target of radius R moving back and forth between two walls at a constant speed. He aims at height R above the ground but the horizontal position is chosen by chance due to the fast motion of the disk. The distance between the walls is L. What is the probability of hitting the disk as a function of the distance between the wall and the shooting point? Where the probability is maximal? Minimal?
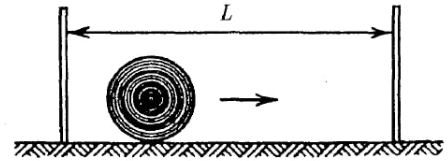
FOR THE NEXT MEETING

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **November 5**.