



## ADVANCED PHYSICS CLUB

NOVEMBER 3, 2024

### 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=ay2024](https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2024)

The practical information about the club and contacts can be found on the same web page.

### TODAY'S MEETING

Today we solved more problems on projectile motion. Our next topic is circular motion, with two projectile problems partially reassigned. For a concise review of the key concepts of circular motion see: <http://hyperphysics.phy-astr.gsu.edu/hbase/rotq.html#ave1>

**Please solve the problems at home!** It is most effective when during the club meeting we discuss the solutions that you already have.

If you feel like you need clarification about the formulation of any problem, you are always welcome to email [apc@schoolnova.org](mailto:apc@schoolnova.org)

### REASSIGNED HOMEWORK

- \*1.** A ball is released from rest and hits an inclined plane after falling a distance  $H$ . Find the distances between points at which the ball hits the inclined plane after the initial collision. Assume that all collisions are perfectly elastic. The plane is inclined at an angle  $\alpha$ . **Note: we have found the distance between the first and second bounce in the class,  $8H \sin \alpha$ . What is left is to find distances to the subsequent bounces.**
- 2.** A water hose is lying on the ground, pointing at an angle  $45^\circ$  to the horizon. Water shoots out of this hose at the speed 10 m/s. Cross section area of the hose is  $5 \text{ cm}^2$ . Find the total mass of water which is in the air at any given moment of time.

### NEW HOMEWORK

- 1.** The distance from the Earth to the Sun is  $1.5 \cdot 10^{11}$  meters. Find the orbital velocity of the Earth  $x$  and its centripetal acceleration.
- 2.** A small object moves on a circle of radius  $r$  with speed linearly growing in time:  $v = kt$ . Find how full acceleration of the object depends on time.
- 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 rock thrown with initial velocity  $v_0$  at angle  $\alpha$  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.

### FOR THE NEXT MEETING

**IMPORTANT:** The next club's meeting is at 3:30pm, via Zoom, on Sunday, **November 10**.