ADVANCED PHYSICS CLUB

OCTOBER 16, 2022

Useful resources

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
    http://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2022
The practical information about the club and contacts can be found on the same web page.

Today's meeting

Today we started discussing kinematics and solved a few problems on motion with constant speed. We continue with more problems on kinematics - from simple to more complicated, now on linear motion with acceleration.

Reassigned Homework

*1. A supersonic airplane is flying horizontally. Two microphones are located on the same vertical line, one below the other by distance l. They have detected arrival of the sound wave from the plane with a relative delay Δt. Speed of sound in the air is c. What is the speed of the plane?

New Homework

1. A speedometer on an old car looks like the one shown on the figure. The speed scale is 25 cm long and displays speed from 0 to 180 km/h. Find speed of the speed-indicator arrow when the car is moving with acceleration 2m/s^2.

2. A bus moving on a straight road at initial speed 15 m/s is approaching a stop. It spends 20 seconds on traveling the last 350 meters before stopping. Prove that acceleration of the bus has changed direction during these 20 seconds.

3. A particle moves with a constant velocity. After traveling a distance L from its source it decelerates with a constant acceleration a until finally stopping. What is the initial velocity such the overall time of the particle's motion is minimal?

4. A body starts moving from some point A. At first it moves with a constant acceleration for time t_0 and then starts moving with a constant acceleration with the same absolute value and opposite direction. After what time since the beginning of the motion it will return to the point A?

5. Two balls are thrown upwards from the same point with the same velocity v with a relative delay Δt. In what time after the second ball is thrown they will collide? Free fall acceleration is g.

*6. You are standing on a platform next to a train which is scheduled to depart at 12:00:00. It's exactly 12:00:00 by your watch, but the second to last carriage already starts moving past you, and it goes past you completely in 10 s. Then the last carriage goes past you in 8 s. The train has in fact departed on time and it is moving with a constant acceleration. How much does your watch fall behind?

*7. An ant is running away from an anthill with speed inversely proportional to the distance from the center of the anthill. At the moment when the ant is at point A which is 1 m away from the center of the anthill, its speed is 2 cm/s. In what time will the ant reach point B which is located 2 m away from the center of the anthill?

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **October 23**.