ADVANCED PHYSICS CLUB

NOVEMBER 2, 2025

Useful resources

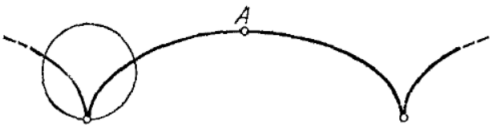
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/classinfo?class_id=2252&sem_id=74`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

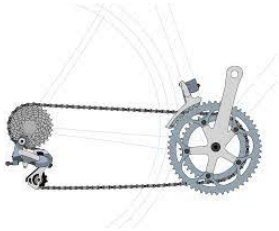
Today we solved several problems on circular motion. Two remaining problems are reassigned. Few new problems on kinematics are assigned.

Reassigned Homework

1. Consider a wheel rolling *without slipping* on a flat horizontal surface. If you track a single point on the rim of the wheel, it follows an interesting trajectory along a curve known as a cycloid (shown on the figure). Find the radius of curvature of a cycloid at the highest point of its arc (this might seem more like a geometry problem, but it has a kinematic solution). The wheel radius R is given.

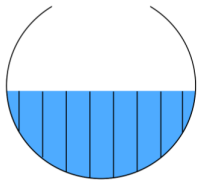


2. a) Explain why bicycles need gears.
b) If you increase the radius on the front gear, will it be easier or harder to pedal? How about the rear gear?



New Homework

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?

For the next meeting

IMPORTANT: The next club's meeting is at 3pm, in Zoom, on Sunday, **November 9**.