ADVANCED PHYSICS CLUB

JANUARY 5, 2025

Useful resources

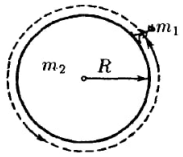
The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
`https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2024`
The practical information about the club and contacts can be found on the same web page.

Today's meeting

We solved most of the assigned problems on momentum conservation law, one remaining problem is reassigned. The next topic is energy conservation law.

Reassigned homework

1. An astronaut of mass m_1 stands on the outer surface of a space station which is a hollow cylinder of mass m_2 and radius R. The astronaut starts going around the station while staying on its surface. Find the trajectory of the astronaut. Initially both the astronaut and the station are at rest.

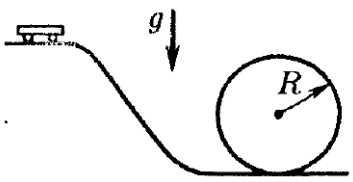


Homework

1. Solve the following problems from the previous F = ma exams:
(a) 8, 13 (2012: `https://www.aapt.org/physicsteam/2013/upload/exam1-2012-unlocked.pdf`)
(b) 14 (2010: `https://www.aapt.org/physicsteam/2010/upload/2010_Fma.pdf`)
(c) 6, 12 (2009: `https://www.aapt.org/physicsteam/2010/upload/2009_F-ma.pdf`)

2. Two identical bodies are given the same initial velocity at the same angle to the horizon. One of the bodies moves freely while the other one moves without friction in a straight tube. Which of the bodies will reach greater height?

3. A cart goes down the smooth rails which are curved in a vertical loop of radius R. The cart starts moving from rest at height h above the lowest point and stays on the rails for the whole way. What is the minimal h such that it is possible?



***4.** Two balls with masses m_1 and m_2 are going towards one another with speeds v_1 and v_2 respectively. What maximal possible amount of heat can be released during their collision?

For the next meeting

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **January 12**.