ADVANCED PHYSICS CLUB

DECEMBER 8, 2019

Today's meeting

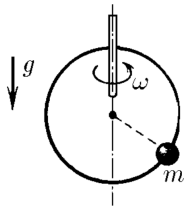
Today we discussed friction force problems from the last homework. We also talked about uniform circular motion and centripetal acceleration/force. We solved the following problem:

1. The mass M is rotating with angular velocity ω about an axis. The mass is attached to the axis by a string of the length L. Find the tension of the string. Assume that the mass is point-like and neglect gravity force. Now replace the string by a uniform rope of mass m and find the tension of the rope at the distance x from the axis of rotation.

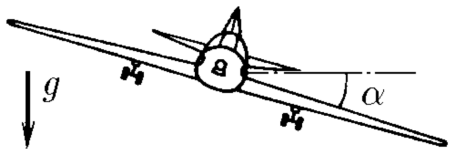
Homework problems

1. "Take" $F = ma$ exam 2015. Read all instructions carefully. The exam should take 75 minutes. Try to time yourself but finish exam even if it takes longer than 75 minutes. Record the time it actually took to solve all problems, mark problems that were difficult or the ones that you were not able to solve. Bring the exam sheets to the next club. The exam can be found here:
`https://aapt.org/physicsteam/2015/upload/exam1-2015-1-8.pdf`

2. A bead is free to move along the smooth wire ring of radius R. The ring is rotating around its vertical diameter with the angular velocity ω. Find the position of the bead.



3. A plane is turning moving along horizontal circle of radius R with constant velocity v. What is the angle between the wing plane and the horizon?



4. A weight of mass m is attached to the axis of rotation by a spring of spring constant k. It moves around the axis with the angular velocity ω along the circle of radius R. Find the length of an unstretched spring.

***5.** A thin elastic string of stiffness (spring constant) k is made into a ring of radius R_0. This ring is spun around its axis. Find the new radius of the ring if its angular velocity is ω.

***6.** A disk is being rotated about a vertical axis with the angular velocity linearly growing with time $\omega = \alpha t$. At what angular velocity a small weight placed on the surface of the disk at the distance R from its axis starts slipping if the friction coefficient is μ?

IMPORTANT

There is no club on December 15. The next club meeting is on January 5, 2020. Have very nice holidays!