

PHYS 211 Homework Assignment

Chapter 11

Problem 1 A unicyclist is moving along a sidewalk at 3 m/s. Her wheel has a radius of 0.75 m.

- What is the angular velocity of the wheel?
- If she comes to a uniform stop in 5 s, what is the angular acceleration of the wheel?
- Assuming the wheel is a uniform hoop of mass 4 kg, what is the torque required in part (b)?
- Draw a picture of the rolling wheel and include a velocity vector for a particle on the wheel at the top, bottom, left and right positions.

Problem 2 A hollow ball rolls along the entire length and off of a sloped table before landing on the floor below. If the table is 2 m long and 1 m high with a slope of 10° , how far away from the table does the ball land?

Problem 3 Calculate the torque on a pebble if the force is given by $\vec{F} = 3\hat{i} - 4\hat{j}$ N and its position is $\vec{r} = 1\hat{i} + 1\hat{j}$ cm. Use

- the origin for your calculation;
- (-1,0) for your calculation.

Problem 4 What is the angular momentum of a 0.80 kg, 2.0 meter long bar rotating about its center of mass at an angular speed of 30 rotations per minute?

Problem 5 Using the idea of angular momentum, explain why an ice skater can speed up their spin when they tuck in their arms, compared to the arms being stretched out.

Problem 6 A 20 g bluray spins freely on a turntable. Its radius is 6 cm and can be approximated as a perfect disk. If its angular speed is initially 15 rad/s when a 3 g piece of putty falls on it from above, sticking to its edge, what is the final angular speed of the bluray disk?