NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat Spring 2021

Problem Set #5

Problem Set Due: Thurs., Feb. 18, 2021
Read OpenStax: Chapter 6.1,6.2,6.3, Chapter 10.1,10.2, Lecture Notes #5

Show explicitly all your work for full credit.

1. Expert TA: **c6.2.1** *conceptual problem—explain*
2. Expert TA: **6.1.5** *conceptual problem—explain*
3. Expert TA: **6.1.2** show calculation and figure
4. Expert TA: **6.1.9** show calculation and figure
5. Expert TA: **6.1.20** show calculation and figure
6. Expert TA: **6.1.36** show calculation and figure
7. Expert TA: **6.1.39** show calculation and figure

8. Suppose a teenager puts her bicycle on its back and starts the rear wheel spinning from rest to a final angular velocity of 250 rpm in 5 s.

   (a) Calculate the angular acceleration in rad/s^2.

   (b) If she now slams on the brakes, causing an angular acceleration of -8.73 rad/s^2, how long does it take the wheel to stop?

9. A powerful motorcycle can accelerate from 0 to 30 m/s (about 108 km/h) in 4.2 s. What is the angular acceleration of its 0.32 m radius wheels?

10. A deep-sea fisherman hooks a big fish that swims away from the boat pulling the fishing line from his fishing reel. The whole system is initially at rest and the fishing line unwinds from the reel at a radius of 4.5 cm from its axis of rotation. The reel is given an angular acceleration of 110 rad/s^2 for 2 s (see Figure 10.8 in OpenStax Physics).

    (a) What is the final angular velocity of the reel?

    (b) At what speed is fishing line leaving the reel after 2 s elapses?

    (c) How many revolutions does the reel make?