NORTHERN ILLINOIS UNIVERSITY

PHYSICS DEPARTMENT

Physics 210 – Mechanics & Heat Spring 2022

Problem Set #9

Problem Set Due: Thurs., April 7, 2022
Read OpenStax: Chapter 11.1-11.4, 11.7, Lecture Notes #9

There will be a Quiz #3 on Tuesday, Nov. 12

Show explicitly all your work for full credit.

Staple solutions to Problems #1-9 together
Number your solutions from #1 to #9

Remember: (1st) read the section then (2nd) try to do the problem without looking at the solutions. This will better prepare you for the next Quiz.

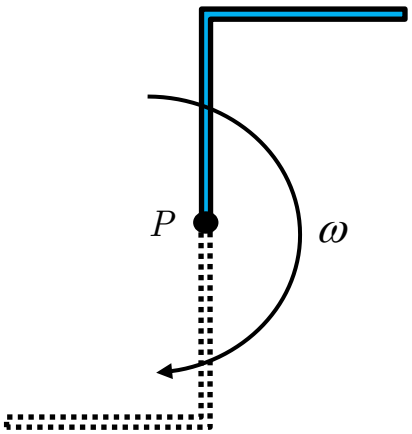
1. Expert TA: **15.1.2** show calculation and figure
2. Expert TA: **15.1.3** show calculation and figure
3. Expert TA: **15.2.1** show calculation and figure
4. Expert TA: **c15.4.5** *conceptual problem—explain*
5. Expert TA: **15.4.3** show calculation and figure
6. Expert TA: **15.4.19** show calculation and figure

Remember: (1st) read the section then (2nd) try to do the problem without looking at the solutions. This will better prepare you for the next Quiz.

7. OpenStax: **Example 11.8** show figure and calculation
8. OpenStax: **Example 11.9** show figure and calculation
9. OpenStax: **Example 11.10** show figure and calculation

Problems #10, #11 is on the next page

Staple solutions to Problem #10, #11 together



10. A thin right angle bracket rotates in a circle about a pivot point P. The length of each side of the bracket is L, and the mass of each side is M. The bracket is initially held in the upright orientation shown above and is then released from rest.

    (a) What is the angular speed of the bracket when it is inverted (the dotted figure) at the bottom of its swing? (Hint: the moment of inertia of the vertical side of the bracket is given in the textbook, the moment of inertia of the top side of the bracket is $I_T = \frac{4}{3}ML^2$)

    (b) What is the bracket's angular acceleration at the instant it is released from rest?

    (c) What is the tangential acceleration of the bracket's center of mass at the instant it is released from rest?

11. NIU students interested in *deep water diving* have come to you because they found out that you are a Physics 210 student. They would like to know how far down they can dive in Lake Michigan before their eardrum ruptures. *Answer their question* by doing Google searches for the surface area of a typical eardrum and the maximum pressure a person's eardrum can handle without rupturing.

    That is, given:

    (a) the surface area of a typical eardrum
    (b) the maximum pressure a person's eardrum can handle without rupturing
    (c) the density of water

    find the maximum depth a person can dive.

    Write the address of the websites you gathered the information for (a) & (b) with your solution.