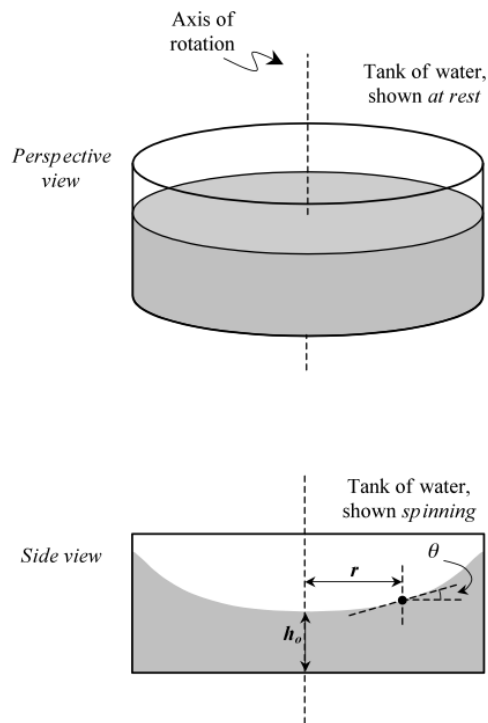


PHYS 2210 Fall 2010 Homework Set 7

Due at start of class on **Oct 14th, 2010**
Show your work!



1. Consider a cylindrical tank of water that is made to spin at a constant angular speed ω about the axis shown in the top diagram. (In the second diagram, assume that the tank has been spinning for a long time such that the water does not move with respect to the frame in which the tank is at rest.)
 - (a) (1 pt) For a location in the (spinning) tank at a horizontal distance r from the axis of rotation, express the magnitude of the net local acceleration in terms of r , ω , and g . Show all work.
 - (b) (1 pt) Use your result in part a to express the angle θ made by the surface of the water (relative to the horizontal) as a function of r . Show all work.

- (c) (1 pt) Let h_0 represent the depth of the water at the exact center of the spinning tank (see diagram). Use your result in part b to show that the surface of the water is paraboloid in shape. That is, if the function $h(r)$ represents the depth of the water as a function of r , show that:

$$h(r) = h_0 + kr^2 \tag{1}$$

where k is a constant value. Show all work.

For some of the Boas problem below, she encourages you to visualize them first in your head. But please do show your work or draw a sketch to explain your thinking!

2. (1 pt) Boas 2.4.4
3. (1 pt) Boas 2.5.2
4. (1 pt) Boas 2.5.20
5. (1 pt) Boas 2.9.8
6. (1 pt) Boas 2.9.16
7. (1 pt) Boas 2.11.6
8. (1 pt) Boas 2.11.12