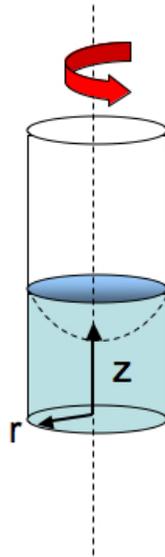


MIT Department of Mechanical Engineering
2.25 Advanced Fluid Mechanics

Problem 1.14

This problem is from “Advanced Fluid Mechanics Problems” by A.H. Shapiro and A.A. Sonin

Cylinder with Liquid Rotating



- (a) Demonstrate that when a cylindrical can of liquid rotates like a solid body about its vertical axis with uniform angular velocity, ω , the free surface is a parabolic of revolution.
- (b) Demonstrate that the pressure difference between any two points in the fluid is given by

$$p_2 - p_1 = \rho g(z_2 - z_1) + \rho\omega^2(r_2^2 - r_1^2)/2, \quad (1.14a)$$

where z is elevation and r is the radial distance from the axis.

- (c) How would the results differ if the can were of square cross section?

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