

A cylindrical can of radius R meters is partly filled with water to a height of H meters and rotated about its axis of symmetry at the fixed rate of ω rad/sec. Prove that the surface of the water takes the shape of a paraboloid. Prove also that the cross-section of the paraboloid at height H is a circle of fixed radius and determine this radius. *Hints:* Prove that a cross-section of the surface through the axis of symmetry of the cylinder is parabola. To do so, consider a water molecule of mass m on the surface. There are only two forces acting on the molecule - the force of gravity and the force of surface tension. You may assume the force of surface tension is normal to the surface. Assume that the water molecule moves in a circle with an angular speed of ω rad/sec.

