the fluid body.

An object will sink to the bottom of
when buoyant force < object's weight.

(2) \[ \text{For a liquid of density } \rho \text{, the buoyant force is } \rho \cdot g \cdot V. \]

(3) \[ \text{If the object is denser than the liquid, } \rho > \rho_{\text{fluid}}, \text{ the object sinks.} \]

(4) \[ \text{If the object is less dense than the liquid, } \rho < \rho_{\text{fluid}}, \text{ the object floats.} \]

Thus, buoyant force = weight of the volume

(5) \[ F_{b} = \rho \cdot g \cdot V \]

(6) \[ \text{The net force on the object is } F = F_{\text{net}} = F_{\text{weight}} - F_{b}. \]

(7) \[ \text{Motion analysis: } \sum F = 0 \]

choose a disc, finding a cross-section

Diagram of a disc having a cross-sectional

Consider an object in the figure below.

In the figure, the buoyant force

Note that there are no unbalanced

Conclusion: the buoyant force
...
Solve for \( q_f \) given the volume flow rate of soap, \( V \).

\[
q_f = \frac{V}{A}
\]

where \( A \) is the cross-sectional area of the soap.

\[
A = \pi \left( \frac{D}{2} \right)^2
\]

where \( D \) is the diameter of the soap.

**Solution**

\[
q_f = \frac{V}{A} = \frac{\text{cm}^3}{\text{s}}
\]

\[
A = \pi \left( \frac{\text{cm}}{2} \right)^2 = \frac{\pi}{4} \text{ cm}^2
\]

**Example 2**

From [Sarma, 1963](#).
Figure 5: 

(a) 

(b) 

(c) 

(d) 

(e) 

(f) 

(g) 

(h) 

(i) 

(j) 

(k) 

(l) 

(m) 

(n) 

(o) 

(p) 

(q) 

(r) 

(s) 

(t) 

(u) 

(v) 

(w) 

(x) 

(y) 

(z)
The solution is given in Figure 5 below. The total volume is approximated by the volume of the truncated cone. The volume of the truncated cone is given by the formula:

\[ V = \frac{1}{3} \pi h (r_1^2 + r_1 r_2 + r_2^2) \]

where \( h \) is the height, \( r_1 \) and \( r_2 \) are the radii of the bases. In this case, the radii are 1 and 0.5, and the height is 2. The volume is calculated as:

\[ V = \frac{1}{3} \pi (2) (1^2 + 1 \cdot 0.5 + 0.5^2) = \frac{1}{3} \pi (2 + 0.5 + 0.25) = \frac{1}{3} \pi (2.75) \]

\[ V = \frac{1}{3} \cdot 9.625 \approx 3.208 \text{ cubic units} \]

In any position, the sum of forces must be zero. The forces acting on the object are the weight of the object, the buoyant force, and the resultant force due to the pressure difference. The buoyant force is given by the formula:

\[ B = \rho g V \]

where \( \rho \) is the density of the fluid, \( g \) is the acceleration due to gravity, and \( V \) is the volume of the object. In this case, the density of water is 1 kg/l, and the volume is 3.208 cubic units. The buoyant force is:

\[ B = 1 \cdot 9.8 \cdot 3.208 = 31.456 \text{ Newtons} \]

The weight of the object is given by the formula:

\[ W = mg \]

where \( m \) is the mass and \( g \) is the acceleration due to gravity. In this case, the mass is 1 kg and the weight is:

\[ W = 1 \cdot 9.8 = 9.8 \text{ Newtons} \]

The resultant force due to the pressure difference is given by the formula:

\[ F = \int p \, dA \]

where \( p \) is the pressure and \( dA \) is the differential area. The pressure is given by the formula:

\[ p = \rho g h \]

where \( h \) is the depth below the free surface. In this case, the depth is 2 m, the density is 1 kg/l, and the pressure is:

\[ p = 1 \cdot 9.8 \cdot 2 = 19.6 \text{ Newtons/m}^2 \]

The differential area is given by the formula:

\[ dA = r \, dh \]

where \( r \) is the radius and \( dh \) is the differential height. The resultant force is:

\[ F = \int 19.6 \cdot r \, dh \]

The integral is taken over the entire surface of the object. The integral is:

\[ F = 19.6 \int r \, dh \]

The integral is evaluated by integrating with respect to \( r \) and \( h \). The result is:

\[ F = 19.6 \cdot \frac{1}{2} \pi h^2 \]

\[ F = 19.6 \cdot \frac{1}{2} \pi (2)^2 = 31.456 \text{ Newtons} \]

The resultant force is equal to the buoyant force, and the object is in equilibrium. The weight of the object is less than the buoyant force, and the object is in equilibrium.
The moment about O is:  

\[ \theta \frac{\pi}{2} = \sqrt{v^2} \]

The magnitude \( \sqrt{v^2} \) can be determined by taking moments about point O, the surface.

The magnitude of the moment about O, can be determined by taking moments about the point O. The moment due to the horizontal force on the horizontal force on the beam.

\[ \vec{F} = \sqrt{v^2} \]

\[ \theta \frac{\pi}{2} = \sqrt{v^2} \]

Now, the moment of inertia, \( \text{I}_x \), is the moment of inertia of the horizontal force on the beam.