Chapter 14

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- Pascal's principle states that a change in the pressure applied to an enclosed fluid is transmitted undiminished to every portion of the fluid and to the walls of the containing vessel
- Density is given as $\rho = \frac{m}{v}$
- Pressure is given as $p = \frac{\Delta F}{\Delta A}$ where ΔF is a force acting on a surface area ΔA. If the force is uniform over a flat area, pressure is given as $p = \frac{F}{A}$
- Archimedes' principle states that when a body is fully or partially submerged in a fluid, the fluid pushes upward with a buoyant force with magnitude $F_b = m_f g$ where m_fR is the mass of the fluid that has been pushed out the way by the body.
- When a body floats in a fluid, the magnitude F_b of the (upward) buoyant force on the body is equal to the magnitude F_g of the (downward) gravitational force on the body
- The apparent weight of the body on which a buoyant force acts is related to its actual weight by $weight_{\text{app}} = weight - F_b$
- Any ideal fluid is incompressible and lacks viscosity (will not resist flow), and its flow is steady and irrotational (a particle submerged in the moving fluid won't rotate around any particular axis)
- A streamline is the path followed by an individual fluid particle
- A tube of flow is a bundle of streamlines
- The flow within any tube of flow obeys the equation of continuity: $R_v = Av = c$ (some constant) , where R_v is the volume flow rate, A, is the cross-sectional area of the tube of flow at any point, and v is the speed of the fluid at that point.
- The mass flow rate R_m is given as $R_m = \rho R_v = \rho A v = c$ (some constant), where R_m is given in units of kg/s
- The equation of continuity states that, for some areas and velocities, $A_1 v_1 = A_2 v_2$
- Bernoulli's equation (the result of applying conservation of mechanical energy to fluids) applies to any ideal fluid along any tube of flow:

$$p + \frac{1}{2}\rho v^2 + \rho g(y_1 - y_2) = \text{some constant}$$