

General Stuff

- Density - $\rho = \frac{\Delta m}{\Delta V}$
 - Uniform Density - $\rho = \frac{m}{V}$
- Pressure - $p = \frac{\Delta F}{\Delta A}$
 - Uniform Force on Flat Area - $p = \frac{F}{A}$
 - Conversions - $1atm = 1.01 \times 10^5 Pa = 760torr = 14.7lb/in^2$

Fluids

We must satisfy several parameters to make life easier, and to use most of these formulae.

1. Incompressible - Density of the fluid is constant
2. Non-turbulent Flow - Think of fluids swirling around an object
3. Isostatic Pressure - Pressure inside the fluid is the same in all directions

- Pressure at Some Depth - $p_2 = p_1 + \rho g (y_1 - y_2)$
 - Pressure at Depth $h \rightarrow p = p_0 + \rho gh$
- Pascal's Principle - 2 Parts
 1. $\vec{F}_o = \vec{F}_i \frac{A_o}{A_i}$
 2. $d_o = d_i \frac{A_i}{A_o}$
- Archimede's Principle - $\vec{F}_{Up} = \vec{F}_{Down}$
 - $\vec{F}_{Bouyant} = m_{Floating}g$
- Continuity - $A_1 v_1 = A_2 v_2$
- Bernoulli's Equation - $p_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2$
 - Fluids at Rest - $p_2 = p_1 + \rho g (y_1 - y_2)$
 - Fluids not Changing Height - $p_1 + \frac{1}{2}\rho v_1^2 = p_2 + \frac{1}{2}\rho v_2^2$

Waves

Usually of form $y = y_m \sin(kx \pm \omega t)$

- y_m - Amplitude, m
- k - Angular Wave Number, rad/m
 - $k = \frac{2\pi}{\lambda}$
 - λ is wavelength, m
- ω - Angular Frequency, rad/s
 - $\omega = 2\pi f$
 - f is frequency, Hz
 - Sign of this goes the opposite the direction the wave is going
 1. Wave going in positive direction (+), then the sign should be negative (-)
 2. Wave going in negative direction (-), then the sign should be positive (+)
- $v = \lambda f$, Wave Velocity, m/s
 - $v = \frac{\omega}{2\pi} * \frac{2\pi}{k} = \frac{\omega}{k}$

Wave Interference

Waves are nice, and they just sum when they interfere. Let:

$$y_1(x, t) = y \sin(kx - \omega t) \quad (1)$$

$$y_2(x, t) = y \sin(kx + \omega t + \varphi) \quad (2)$$

$$Y(x, t) = 2y \sin(kx - \omega t) + \sin(kx + \omega t + \varphi) \quad (3)$$

You can usually use Trigonometric Formulas to simplify Equation 3.

Thermodynamics

Quantum Mechanics

Reference Material

Trigonometric Formulas

$$\sin (\alpha)+\sin (\beta)=2 \sin \left(\frac{\alpha+\beta}{2}\right) \cos \left(\frac{\alpha-\beta}{2}\right) \quad (4)$$