Fluids

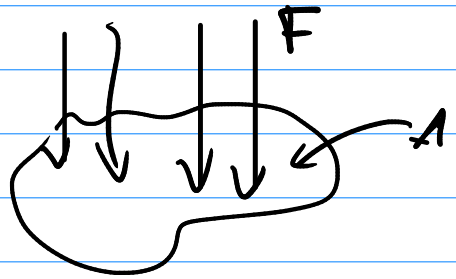
liquids — gases

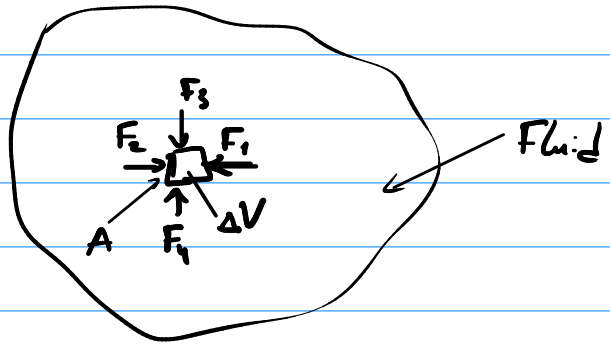
Density → ρ [rho], $\rho = \frac{m}{V}$

water => $\rho_w = \frac{1000\,kg}{m^3} = \frac{1\,kg}{(10\,cm)^3} = \frac{1\,kg}{1\,Liter}$

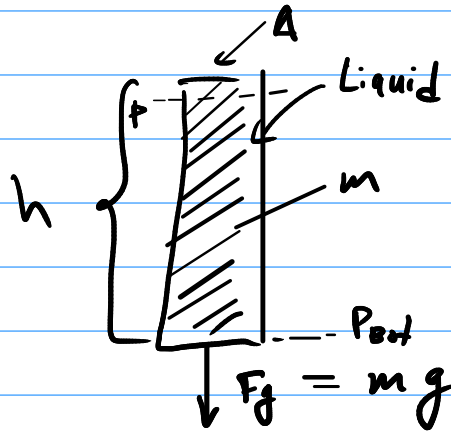
Pressure

$P = \frac{F}{A}$





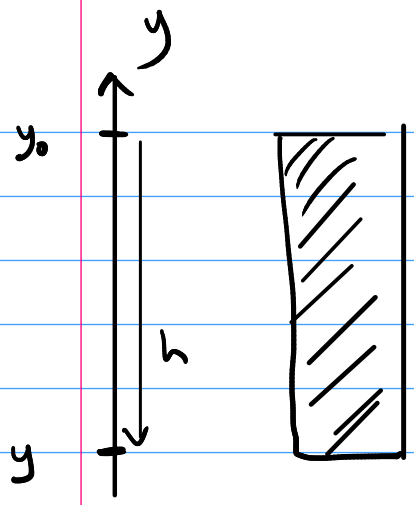
$\frac{F_1}{A} = \frac{F_2}{A} = P$



$= \rho \cdot V \cdot g = \rho \cdot h \cdot A \cdot g$

$P = \frac{mg}{A} = \frac{\rho \cdot h \cdot A \cdot g}{A} = \rho \cdot h \cdot g$

$P = \rho h g$ iff ρ, g = const



$P(y) =$

$P(y_0) = 0$

$P(y = y_0 - h) = \rho g h$

$= +\rho g \cdot (y_0 - y)$

$\frac{dP}{dy} = \frac{d(+\rho g (y_0 - y))}{dy} = -\rho g$

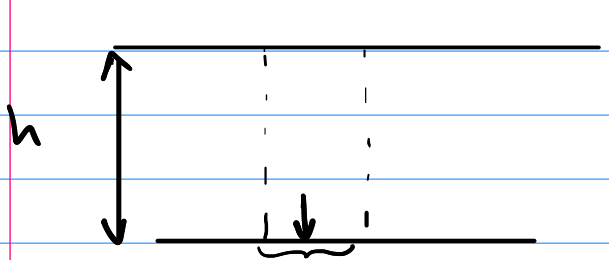
Weight of the air

SI unit of pressure

$P = 1\ atm = 100\ kPa = 10^5\ Pa = \frac{m_A g}{A}$

$m_A = \frac{P_{atm} \cdot A}{g} = \frac{10^5 \cdot (10^{-2})^2}{10} = \frac{10^5 Pa \cdot 10^{-4} m^2}{10}$

$= 1\ kg$



$F_B = W_A + W_W =$

$P_B = \frac{F_B}{A} = \frac{W_A}{A} + \frac{W_W}{A} =$

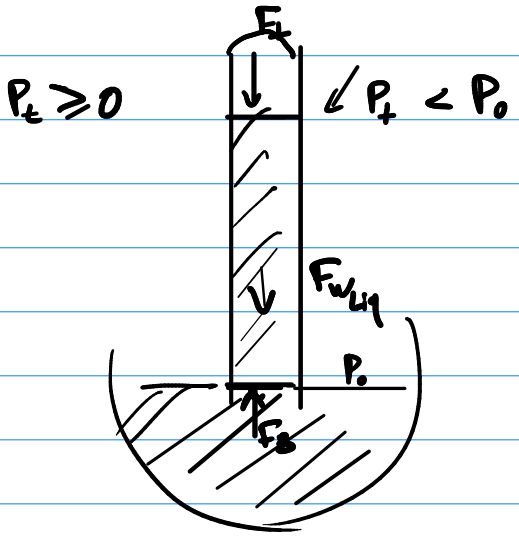
$= 100\ kPa$

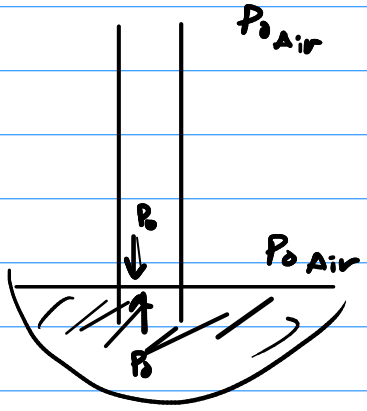
$$P_B = P_A + \rho g h = P_A + 1000 \frac{kg}{m^3} \cdot 10 \frac{m}{s^2} \cdot h$$

$$= P_a + 10^4 \cdot h \left[\frac{Pa}{m}\right]$$

$$\parallel$$

$$10^5 Pa$$





$F_{up} = F_{down}$

$F_B = F_{w_L}$

$P_0 \cdot \cancel{A} = \underbrace{\rho \cdot h \cdot \cancel{A}}_{m_w} g$

$$h \leq \frac{P_0}{\rho \cdot g} = \frac{10^5 Pa}{1000 \cdot 10} =$$

$$= 10 m$$