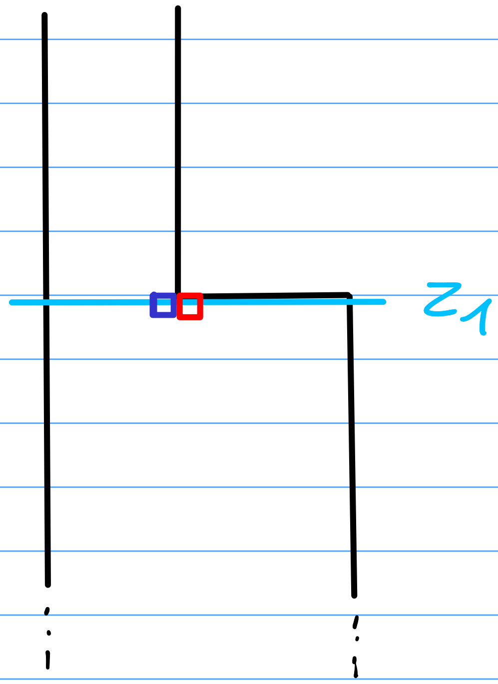
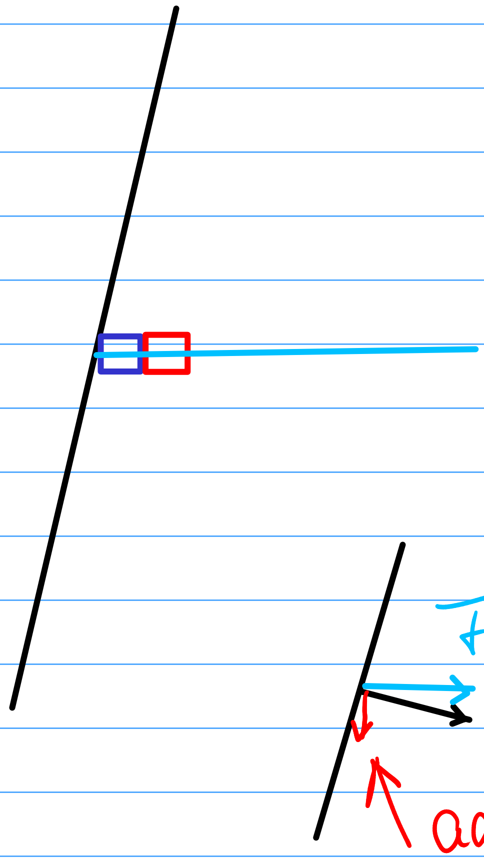
Chap. 2, p. 17



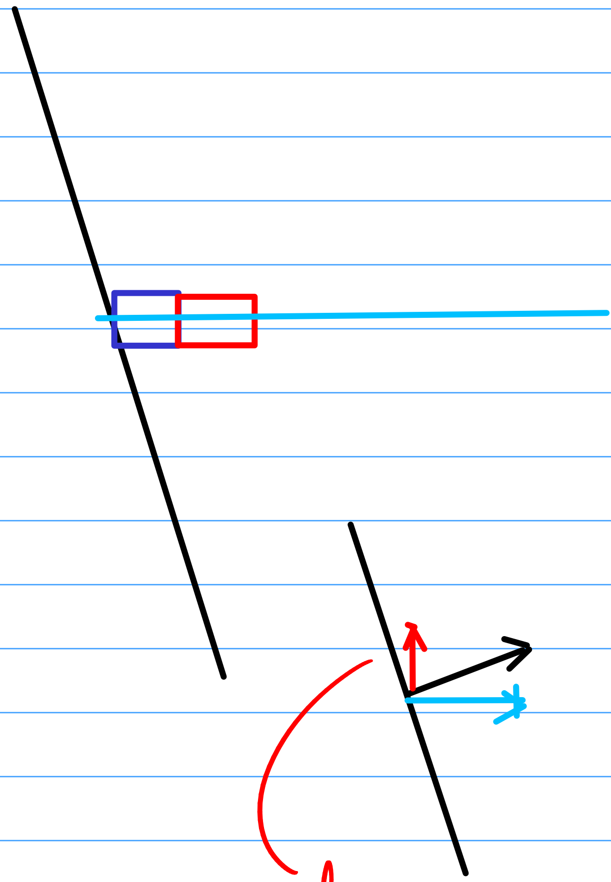
Pressure the same at one level, otherwise one fluid element would move. But that's forbidden.



$p(z) =$ constant for given

compensates pressure from neighboring fluid elements

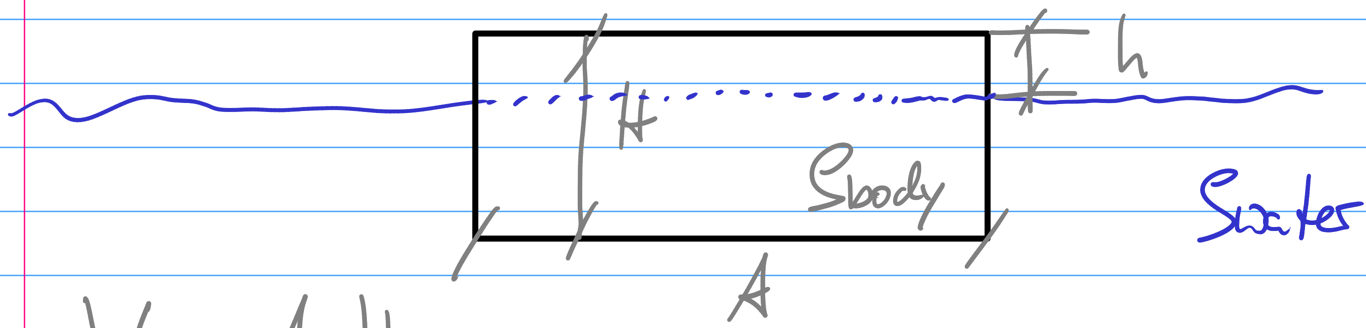
additional force downward



pressure constant at constant z

upward force to compensate additional weight.

Chap 1, p. 22



$$V_K = A \cdot H$$

$$m_{Kiste} = \rho_{body} \cdot V_K \Rightarrow F_G = g\, m_{Kiste}$$

Buoyancy force:

We need the volume of the displaced water:

$$V_K^* = A \cdot (H - h)$$

$$F_B = g\, \rho_{water} \cdot V_K^*$$

Floating: $F_G = F_B$

p.t.o.

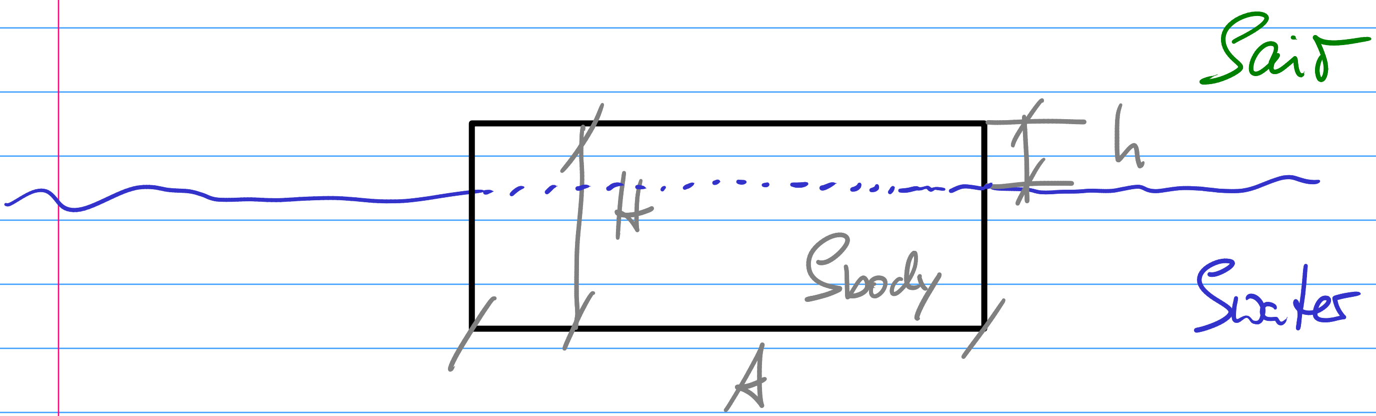
$$m_K \cancel{g} = \cancel{g}\, \rho_{water} V_K^{d}$$

$$\rho_{body} \cdot V_K = \rho_{water} A (H - h)$$

$$\rho_{body} \cdot \cancel{A} \cdot H = \rho_{water} \cancel{A} (H - h)$$

$$-\rho_{body} H \overset{+}{-} \rho_{water} H = \rho_{water} (\overset{+}{-} h) \quad | \rho_w$$

$$\boxed{\frac{\rho_w - \rho_b}{\rho_w} H = h}$$



$$F_G = F_{B,water} + F_{B,Air}$$

$$\cancel{g}\,\rho_{body}\,\cancel{A}\,H = \cancel{g}\,\rho_{water}\,\cancel{A}\,\underbrace{(H-h)}_{\text{inside water}}$$

$$+ \cancel{g}\,\rho_{air}\,\cancel{A}\cdot \underbrace{h}_{\text{inside Air}}$$

$$\Rightarrow \rho_{body} H = \rho_w H + \rho_{air} h - \rho_{water} h \quad \Big|\, -\rho_w H$$

$$(\rho_{body} - \rho_{water}) H = (\rho_{air} - \rho_{water}) h$$

$$\boxed{\frac{\rho_{body} - \rho_{water}}{\rho_{air} - \rho_{water}} H = h}$$

$$\Rightarrow \frac{\rho_{water} - \rho_{body}}{\rho_{water} - \rho_{air}} H = h$$