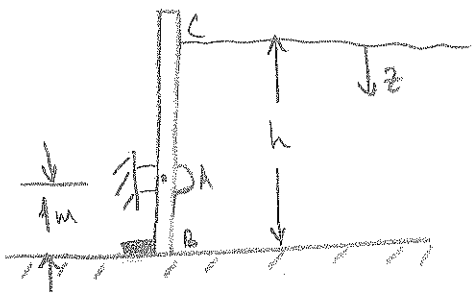
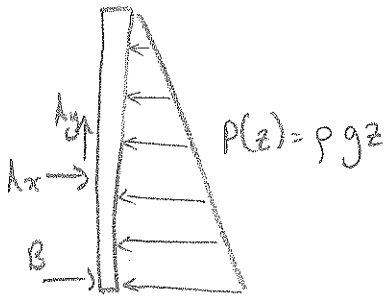
8.1.4)



FBD



$\rho = 1000\ kg/m^3 \quad g = 10\ m/s^2$

$l = 5m$ (length into page)

a) At what h does board BC begin to pull away from B?

This happens when there is no force on the stop at B.

With no force at B,

$$+\circlearrowleft \sum M_A = \int_0^h \underbrace{\rho g z}_{\text{pressure}} \underbrace{(h - 1m - z)}_{\text{moment arm}} l\, dz = 0$$

$$l\rho g\left[\frac{1}{2}(h-1m)z^2 - \frac{1}{3}z^3\right]\Big|_0^h = l\rho g\left[\frac{1}{2}(h-1)h^2 - \frac{1}{3}h^3\right] = 0$$

$$\frac{1}{2}(h-1m) - \frac{1}{3}h = 0 \Rightarrow \frac{1}{6}h = \frac{1}{2}m \Rightarrow \boxed{h = 3m}$$

b) What is the reaction at A?

Force at B still zero

$$\sum F_x = A_x - \int_0^h \rho g z l\, dz = 0$$

$$A_x = \frac{1}{2}\rho g z^2 l\Big|_0^h = \frac{1}{2}\rho g h^2 l = \frac{1}{2}(1000\ kg/m^3)(10\ m/s^2)(3m)^2(5m)$$

$$\boxed{A_x = 2.25 \cdot 10^5\ N = 225\ kN}$$

$$\sum F_y = A_y = 0 \Rightarrow \boxed{A_y = 0}$$