

14-19) What's the force on the wall for a slice "h" of water in the aquarium?

pressure is $p = p_0 + \rho g h$ (depth)

let $p_0 = 0$ since there's air pressure on both sides of the glass anyway.

So, what's the pressure. Area = force of a thin slice of side dy tall?

$p \sim$ same if dy is thin, so

$$dF = p \cdot dA = (\rho g y)(8m \, dy)$$

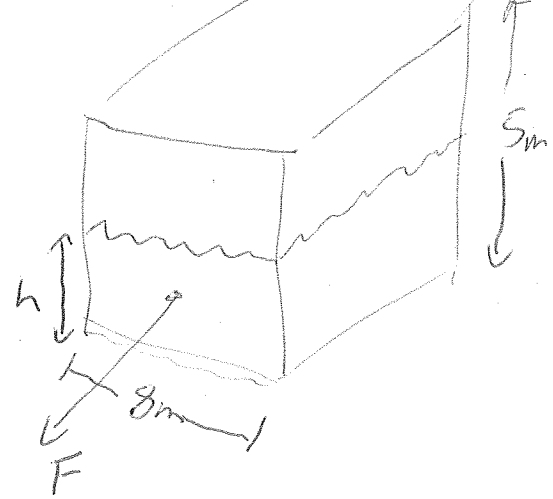
integrate from $y = 0 \rightarrow h$, $F = \int dF = \int_0^h \rho g (8m) y \, dy$

$$F = \frac{1}{2} \rho g h^2 (8m)$$

So, difference in forces = $\Delta F = F_{4m} - F_{2m} = \frac{1}{2} \rho g (8m) (4m^2 - 2m^2)$

$\rho_{\text{water}} = 998 \text{ kg/m}^3$, $g = 9.8 \text{ m/s}^2$, so

$$\Delta F = 4.69 \times 10^5 \text{ N}$$



side view:

