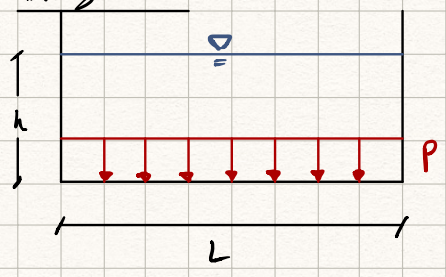
Pressure

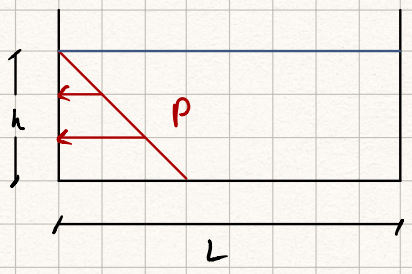
Horizontal



$$P = \rho g h$$

$$F = PA = P \cdot l \cdot L$$

Vertical



$$F = \iint_A \rho g h l \, dA$$

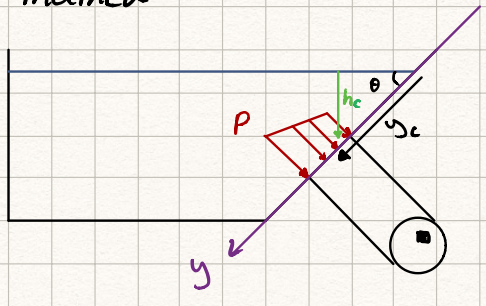
$$= \rho g \boxed{\iint_A h l \, dA} \rightarrow \text{Centroid}$$

$$= \rho g h_c l$$

$$= \rho g \frac{H}{2} l$$

$$F = \rho g h_c A$$

Inclined



1) Diffine y - axis
2) $y_c = L + D/2$
3) $h_c = (L + D/2) \sin\theta$
4) $F =$

$$F = \iint P \, dA = \rho g \iint h \, dA$$

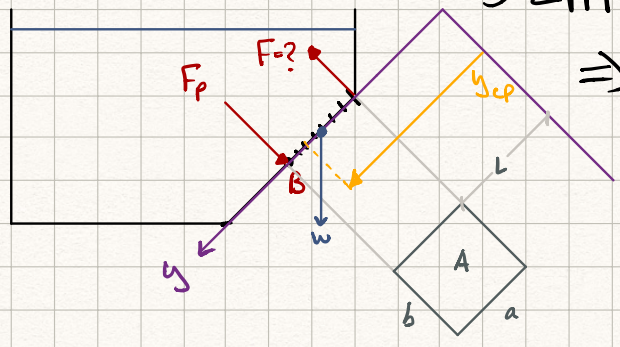
$$= \rho g \sin\theta \, y_c A$$

$$F_p = \rho g h_c A$$

5) $y_{cp} = y_c + \frac{\overline{I}}{y_c A}$

y_{cp} ↑ center of Pressure

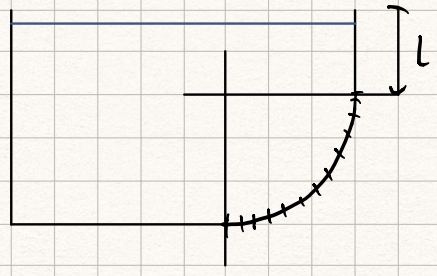
Gates



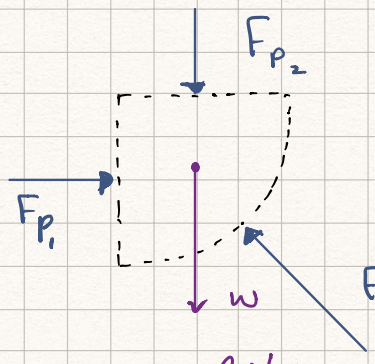
$$\textcircled{4}\ \Sigma M_B = 0$$

$$\Rightarrow F_a - F_p(L + a - y_{cp}) \pm M_w = 0$$

curved gate



FBD (just above the gate)



$w = \rho \forall g$

F_{p_1} = vertical F_p

F_{p_2} = horizontal F_p

$$F_{p_2} = (\rho g L)(l D/2)$$

$$F_{p_1} = \rho g h_c A$$

$$= \rho g \left(L + \frac{4D}{6\pi}\right)\left(l \frac{D}{2}\right)$$

$$w = \rho \frac{1}{4} \pi \frac{D^2}{4} l g$$