Printout

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Announcements

- Quiz 5 next week (be sure to register for TAM 211 separately)

- Upcoming deadlines:
- Friday (4/12): Written Assignment
- Tuesday (4/16): PL HW12

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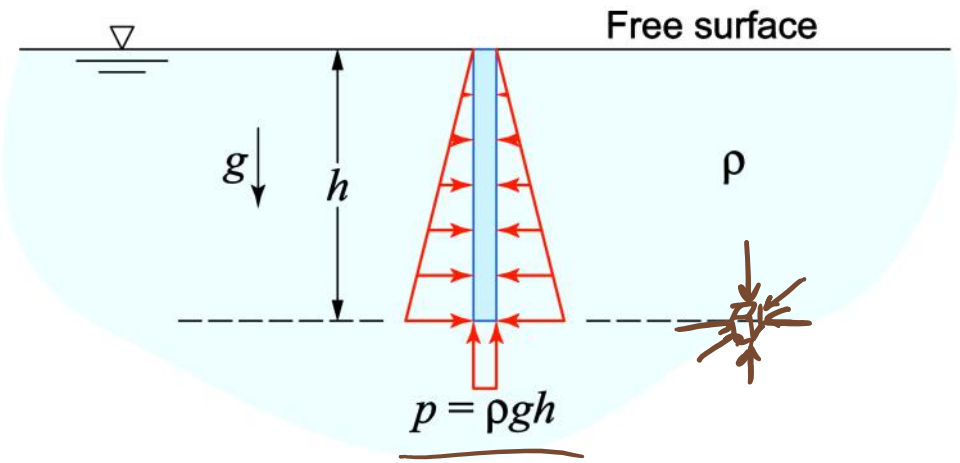
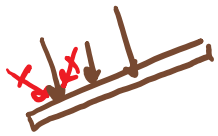
Recap: Fluid Pressure

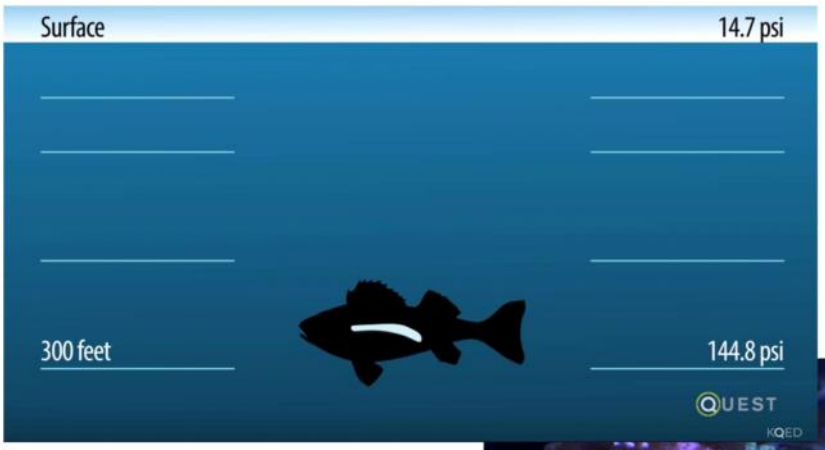
- Pressure varies *linearly* from the free surface.
- Pressure is *constant* along any horizontal plane.
- Pressure acts perpendicular to the submerged object's surface.

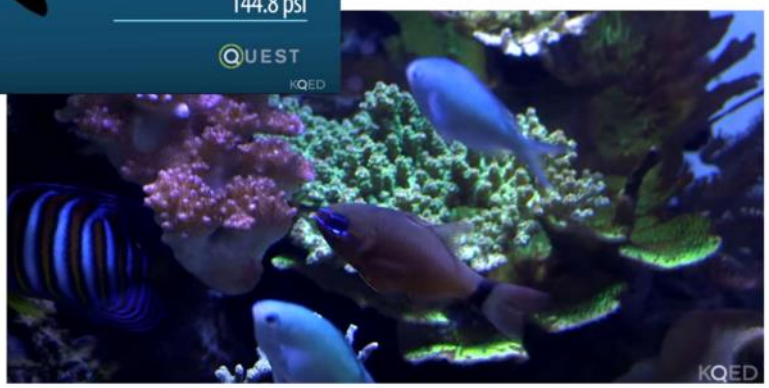


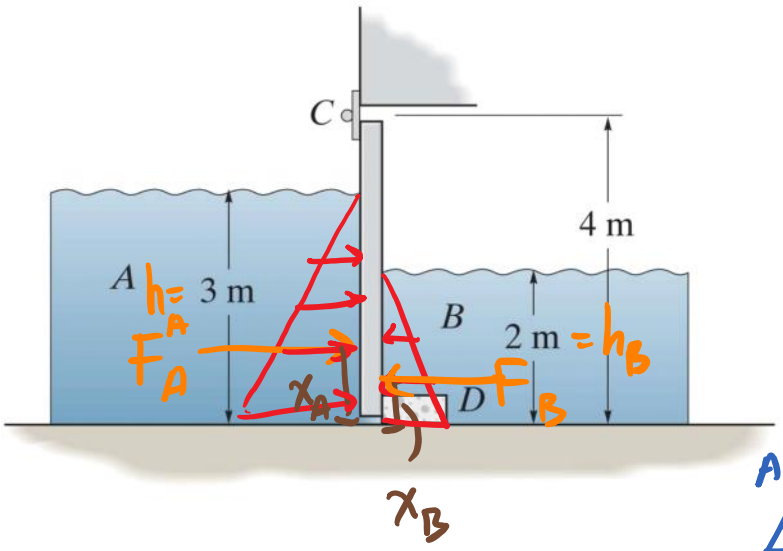


Deep Sea Fish

How to transport deep sea creatures to aquariums?

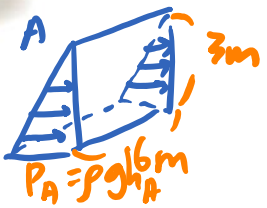






For the condition of high tide shown, determine the reactions developed at the hinge C and stop block. The length of the gate is 6 m and its height is 4 m. The density of the water is 1000 kg/m^3

$h_A = 3\text{ m}$, $h_B = 2\text{ m}$, F_A, F_B, x_A, x_B



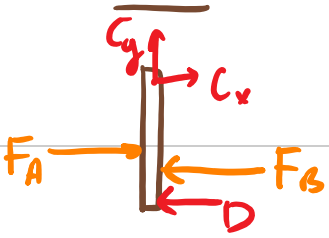
$P_A = \rho g h_A$

$P_B = \rho g h_B$

$x_A = \frac{1}{3}(3\text{m}) = 1\text{ m}$ $\quad x_B = \frac{1}{3}(2\text{m}) = \frac{2}{3}\text{ m}$

$F_A = \frac{1}{2}P_A(3\text{m})(6\text{m})$ $\quad F_B = \frac{1}{2}P_B(2\text{m})(6\text{m})$

FBD



EoE

$\Sigma M_D = 0 = F_B(\frac{2}{3}) - F_A(1) - C_x(4\text{m}) = 0$

$C_x = \dfrac{\frac{2}{3}F_B - F_A}{4}$

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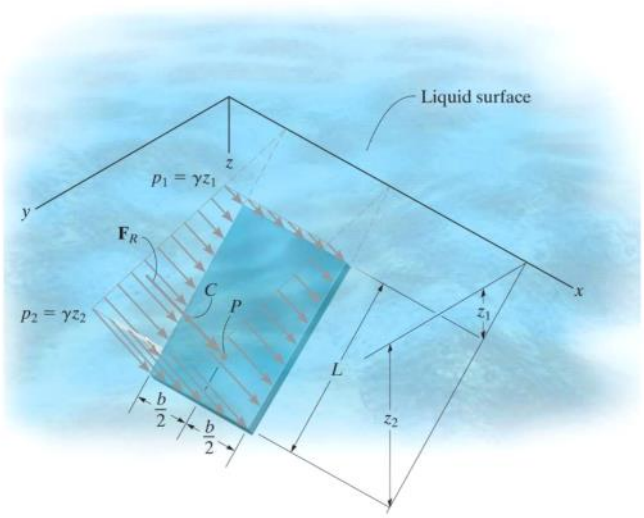
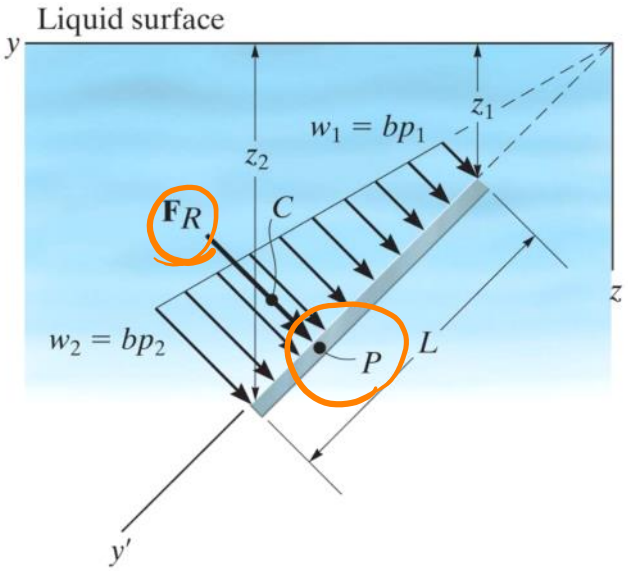
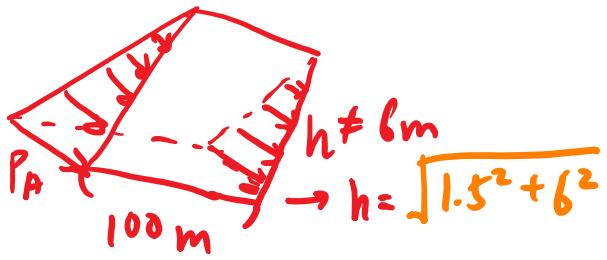
Fluid Pressure

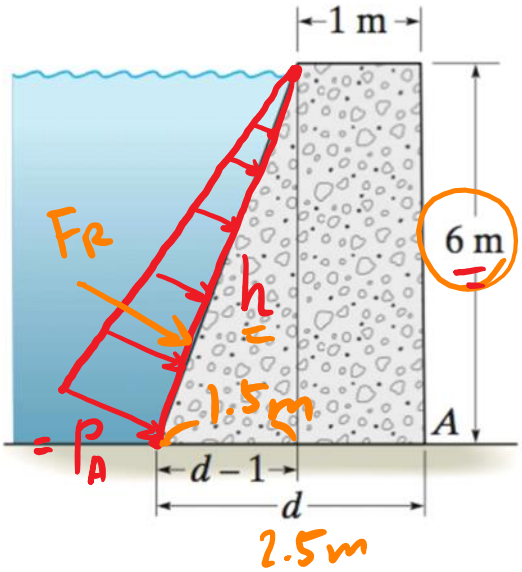
For an incompressible fluid at rest with mass density , the pressure varies linearly with depth z





Determine the magnitude of the resultant force acting on the 100-m wide dam due to hydrostatic pressure. Let $d = 2.5$ m.
($\rho_{water} = 1$ Mg/m^3)





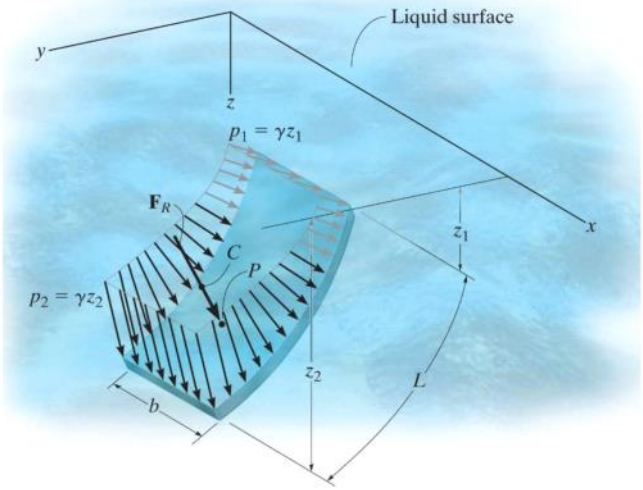
$F_R = \left(\frac{1}{2} P_A \sqrt{1.5^2+6^2}\right)(100\text{m})$

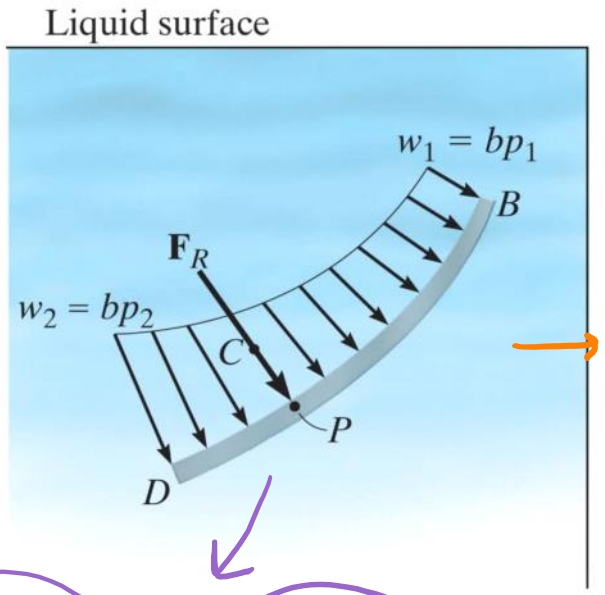
$P_A = \rho g(\text{depth})$

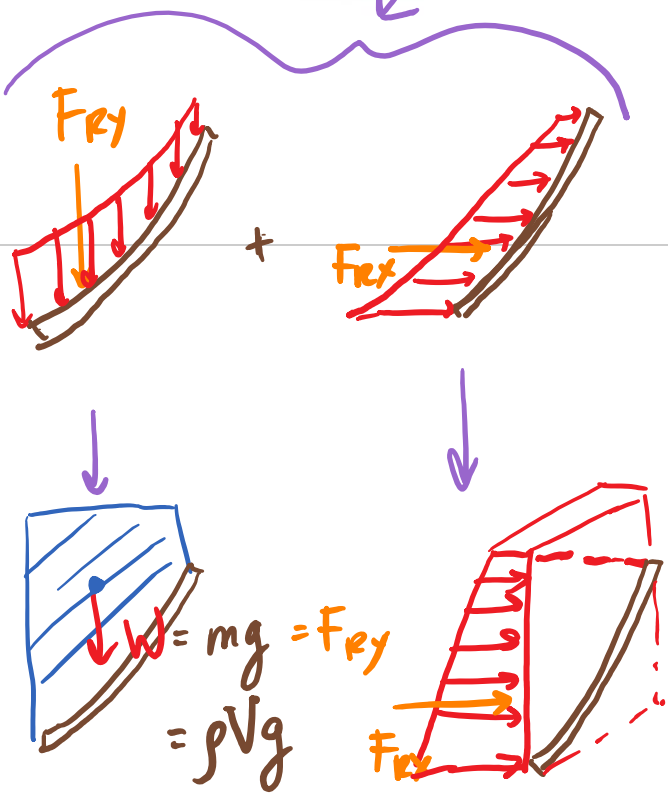
$= (1\ \text{Mg/m}^3)(9.81\ \frac{\text{m}}{\text{s}^2})(6\text{m})$

Fluid Pressure

For an incompressible fluid at rest with mass density , the pressure varies linearly with depth z







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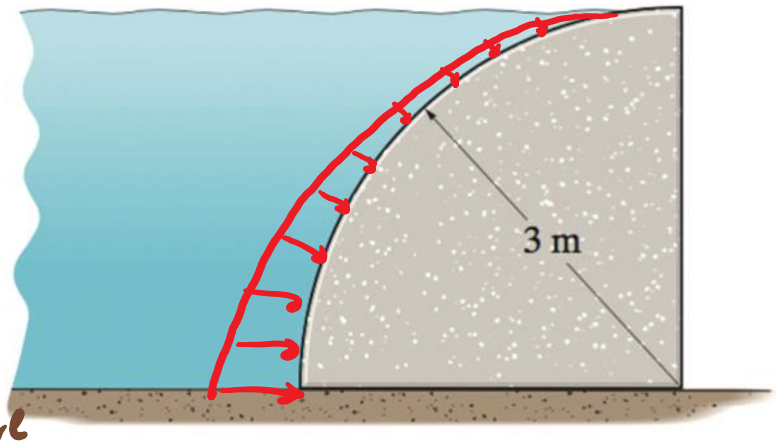
Determine the magnitude of the resultant force acting on on the 10-m wide dam due to hydrostatic pressure.
($\rho_{water} = 1\ Mg/m^3$)

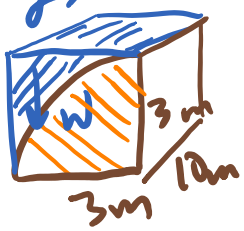


Vertical

square

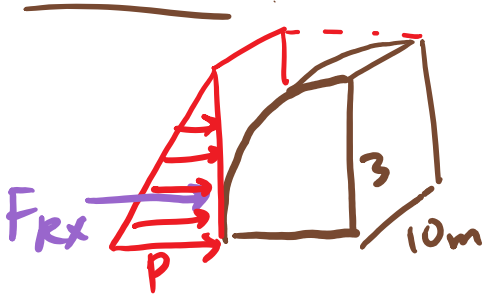
$W = \rho V g$, $V = \left(3 \times 3 - \frac{\pi 3^2}{4}\right)(10m)$

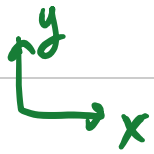
quarter circle



$F_{Ry} = W$

Horizontal





$F_{Rx} = \frac{1}{2} P (3m)(10m)$

$P = \rho g (3m)$

$F_{Rx} = \frac{1}{2} \rho g (3m)(3m)(10m)$

$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2}$

$\vec{F}_R = F_{Rx}\hat{i} - F_{Ry}\hat{j}$

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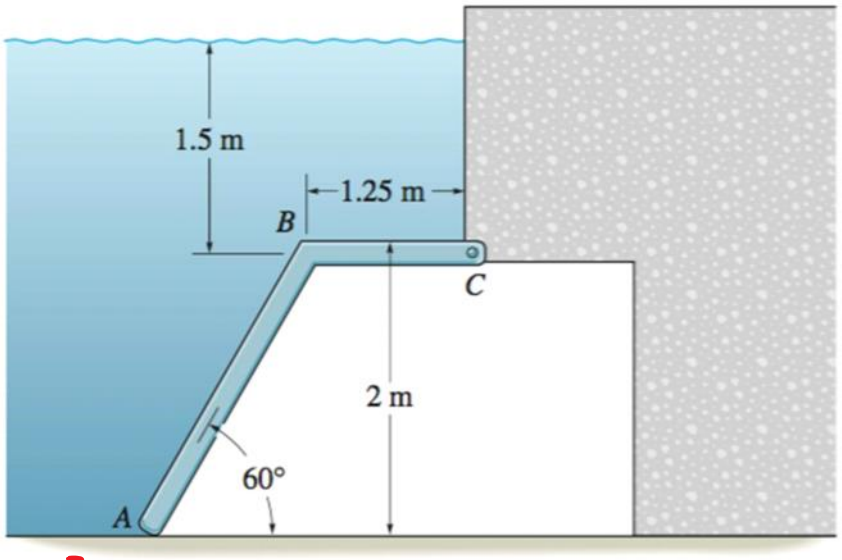
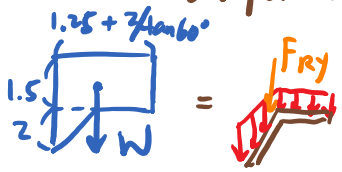
Determine the magnitude of the resultant force acting on gate *ABC* due to hydrostatic pressure. The gate has a width of 1.5 m.
($\rho_{water} = 1\ Mg/m^3$)



Vertical component :



$F_{RY} = W$

$= \rho\left[\left(1.25 + \frac{2}{\tan 60°}\right)1.5 + \frac{1}{2}(2)\left(\frac{2}{\tan 60°}\right)\right](1.5)g$

Horizontal component :

$F_{RX} = \frac{1}{2}(P_A + P_B)(2m)(1.5m)$

$P_B = \rho g(1.5m)$, $P_A = \rho g(3.5m)$