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
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?

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<th>Surface</th>
<th>14.7 psi</th>
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<th>300 feet</th>
<th>144.8 psi</th>
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[Image: Aquarium with deep sea creatures]
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$^3$.

\[ \chi_A = \frac{1}{3} (3\text{m}) = 1\text{m} \quad \chi_B = \frac{1}{3} (2\text{m}) = \frac{2}{3}\text{m} \]

\[ P_A = \rho g h_A \]
\[ P_B = \rho g h_B \]

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

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

\[ C_x = \frac{2}{3} F_B - F_A \]
Fluid Pressure

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

\[ p_1 = \gamma z_1 \]
\[ p_2 = \gamma z_2 \]
\[ w_1 = bp_1 \]
\[ w_2 = bp_2 \]
Determine the magnitude of the resultant force acting on the 100-m wide dam due to hydrostatic pressure. Let $d = 2.5$ m.

$(\rho_{\text{water}} = 1 \text{ Mg/m}^3)$

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

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

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

For an incompressible fluid at rest with mass density $\gamma$, the pressure varies linearly with depth $z$
Determine the magnitude of the resultant force acting on the 10-m wide dam due to hydrostatic pressure.

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

**Vertical component:**

\[ F_{ry} = \frac{1.25 \cdot 2 \cdot \sin 60^\circ}{\tan 60^\circ} \cdot 1.5 \]

\[ = \rho \left[ \left( 1.25 + \frac{2}{\tan 60^\circ} \right) \cdot 1.5 \right] \]

\[ + \frac{1}{2} \left( 2 \cdot \frac{2}{\tan 60^\circ} \right) \cdot (1.5) \cdot g \]

**Horizontal component:**

\[ F_{rx} = \frac{1}{2} (P_a + P_b) \cdot 2 \text{ m} \cdot 1.5 \text{ m} \]

\[ P_b = \rho g (1.5 \text{ m}) \]

\[ P_a = \rho g (3.5 \text{ m}) \]