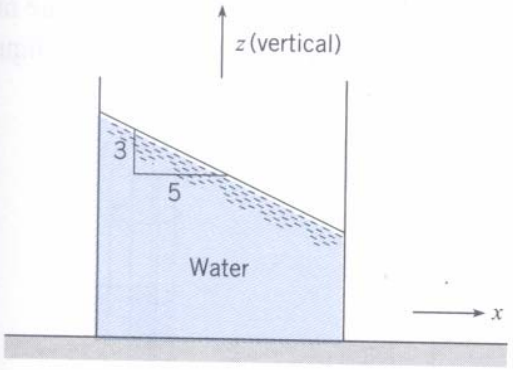
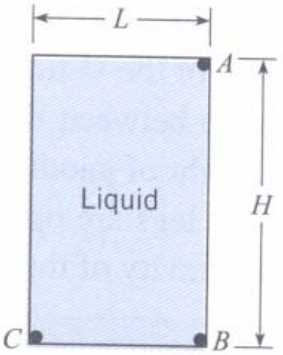
5.18 This tank is accelerated in the x direction to maintain the liquid surface slope at $-5/3$. What is the acceleration of the tank?



PROBLEM 5.18

5.20 The closed tank shown, which is full of liquid, is accelerated downward at $\frac{2}{3}\,g$ and to the right at one g. Here $L = 2$ m, $H = 3$ m, and the liquid has a specific gravity of 1.3. Determine $p_C - p_A$ and $p_B - p_A$.



PROBLEMS 5.19, 5.20

5.20

$$\frac{\partial p}{\partial z} = -\rho(g + a_z) = -S_{ew}(g + a_z) = -1.3 \cdot 1000 \cdot \left(9.81 - \tfrac{2}{3} \cdot 9.81\right)$$

$$= -4251 \text{ N/m}^3$$

$$\frac{p_A - p_B}{z_A - z_B} = -4251 \qquad \text{pressure decreases} + z \text{ increases} - z$$

$$p_B - p_A = -4251\,(\underbrace{z_B - z_A}_{-H}) = 12.75 \text{ kPa}$$

$$\frac{\partial p}{\partial x} = -\rho a_x = -S_{ew}\, g = -12.75 \text{ kPa} \qquad \text{pressure decreases} + x \text{ increases} - x$$

$$\frac{p_B - p_C}{x_B - x_C} = -12.75 \text{ kPa}$$

$$p_C - p_B = -12.75\,(\underbrace{x_C - x_B}_{-L}) = 25.51 \text{ kPa}$$

$$p_C - p_A = 38.26 \text{ kPa}$$

5.18

$$\tan\theta = \frac{a_x}{g + a_z} = \frac{a_x}{g} \Rightarrow a_x = g \tan\theta$$

$$= 9.81 \times 3/5$$

$$= 5.89 \text{ m/s}^2$$