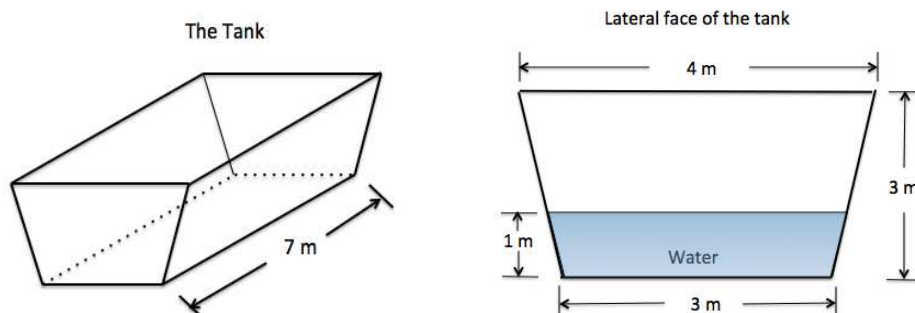
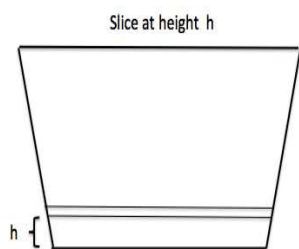


6. [12 points] A tank whose base is at ground level has lateral walls in the form of a trapezoid 3 meters wide at the bottom, 4 meters wide at the top, and 3 meters high, and has a length of 7 meters, as shown in the figures below. The tank contains water up to a level of 1 meter. The density of water is 1000 kg per m^3 .



- a. [8 points] Write an expression that approximates the work done in lifting a horizontal slice of water with thickness Δh that is at a height of h meters above the ground to the top of the tank. Use $g = 9.8 \text{ m/s}^2$ for the acceleration due to gravity.



Solution: $\text{Work}_{\text{slice}} \approx 1000\left(\frac{1}{3}h + 3\right)(7)g(3 - h)\Delta h \approx 68600\left(\frac{1}{3}h + 3\right)(3 - h)\Delta h$

- b. [4 points] Write an expression for the work required to pump all the water in the tank to the top of the tank. You do not need to evaluate the expression. Include units.

Solution: $\text{Work}_{\text{water}} = \int_0^1 68600 \left(\frac{1}{3}h + 3 \right) (3 - h) dh \text{ Joules.}$