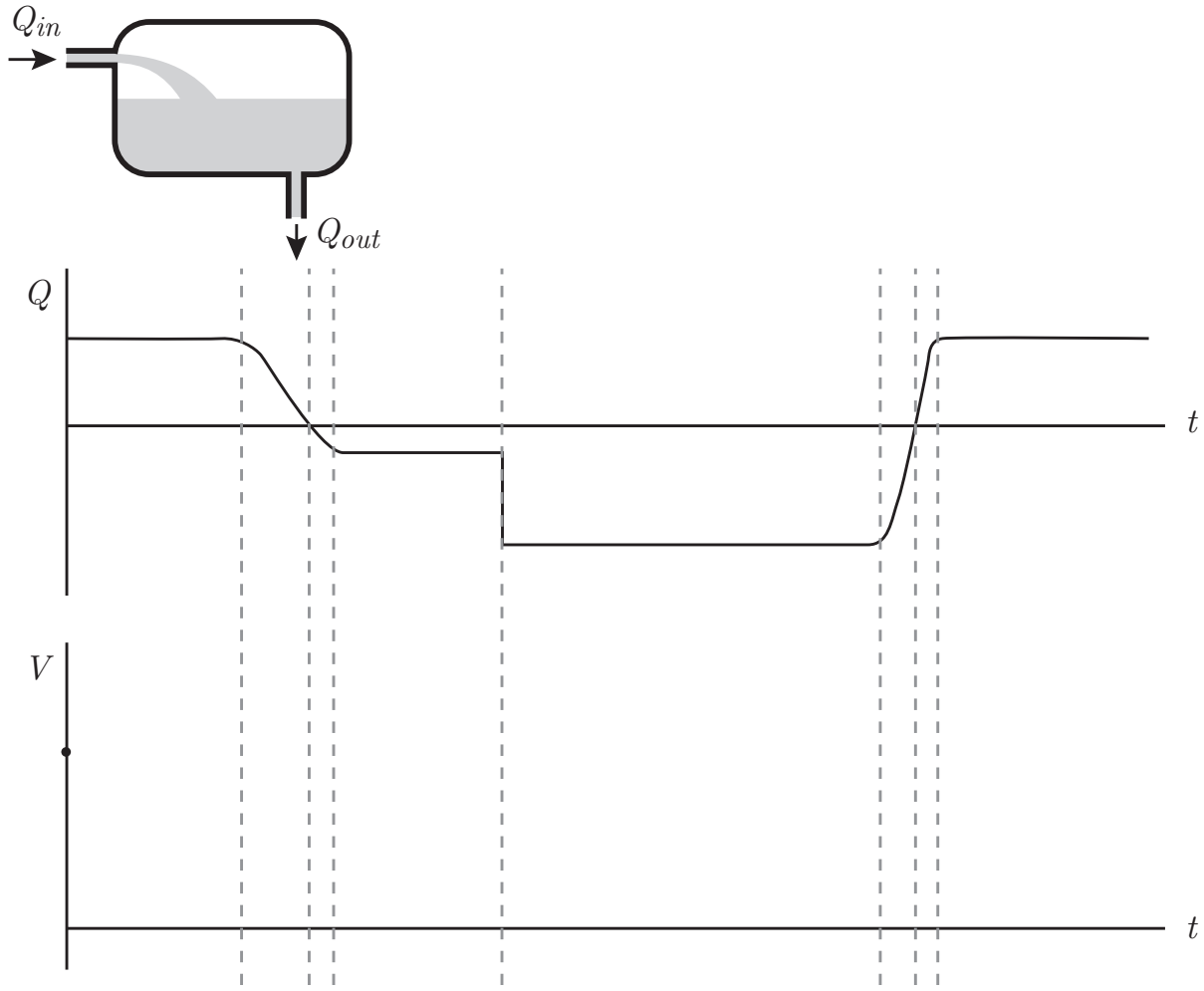
Suppose we have a large tank of water. Perhaps it is the tank on top of a tall water tower. The tank has an inlet through which water flows into the tank at a rate Q_{in}. Here, Q_{in} is measured in units of liters per second. Similarly, the tank has an outlet through which water flows out of the tank at rate Q_{out}, also measured in units of liters per second.

Both Q_{in} and Q_{out} change with respect to time. We define

$$Q(t) = Q_{in}(t) - Q_{out}(t), \tag{1}$$

as the *net* flow of water *into* the tank. In the figure below, we show a plot of Q with respect to time. Given this, your job is to sketch a plot of the total volume V of water in the tank as a function of time. At time $t = 0$, the initial Volume of water is at the small dot on the V axis. Assume both plots have the same time scale. I have provided vertical dashed lines to align your plot of V vs. t with my plot of Q vs. t.



Now, let's do the reverse operation. Suppose you are given the volume of water V as a function of time as shown in the top plot. Given this, generate the plot of the net flow rate, Q, as a function of time.