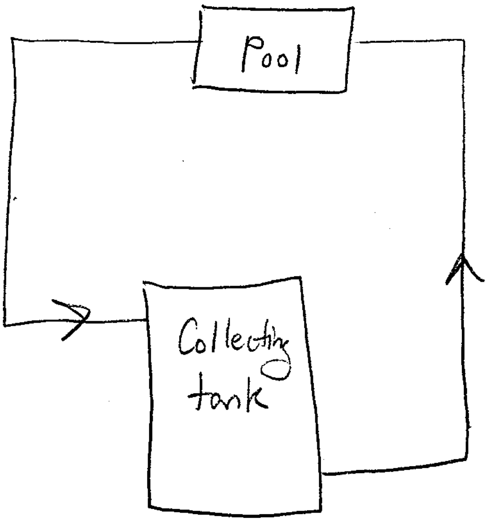

at $t=0$,

m_{salt} in pool + lines = 10 kg

m_{salt} in collecting tank = 0 kg

at some time, all salt collects in tank.

Want to know $m_{salt}(t)$ in tank

$$\frac{dm_{salt}}{dt} = \text{in} - \text{out}$$

$$= \dot{m}_{in} \cdot \frac{m_{salt}(t)}{m_{system}} - \dot{m}_{out} \cdot \frac{\cancelto{0}{m_{salt}(t)}}{m_{system}}$$

$$\int \frac{dm_{salt}}{m_{salt}} = \int \frac{\dot{m}_{in}}{m_{system}} dt$$

$$\ln(m_{salt}) = \frac{\dot{m}_{in}}{m_{system}} t + c$$

$$m_{salt}(t) = Ae^{\frac{\dot{m}_{in}}{m_{system}} t}$$

if $m_{salt}(0) = 0$,

$$0 = Ae^{0}$$

$$A = 0$$

$m_{salt}(t) = 0$ ← not right

At some time, m_{salt} in tank will equal 10 kg. Not sure how to use this as boundary condition.

Look at it from pool's perspective.

∅ concentration

$$\frac{dm_{salt}}{dt} = \cancel{in} - out \qquad \dot{m}_{in} = \dot{m}_{out}$$

$$\frac{dm_{salt}}{dt} = -\dot{m}_{out} \cdot \frac{m_{salt}}{m_{system}}$$

$$m_{salt}(t) = A e^{-\frac{\dot{m}_{out}}{m_{system}} \cdot t}$$

if $m_{salt}(0) = 10 \text{ kg}$

$$10 = A$$

$$m_{salt}(t) = m_0 e^{-\frac{\dot{m}_{out}}{m_{system}} \cdot t}$$

Concentration in the tank must be opposite depletion in the pool.

$$\therefore \quad m_{salt_{(tank)}}(t) = m_0 \left(1 - e^{-\frac{\dot{m}_{out}}{m_{system}} \cdot t}\right)$$