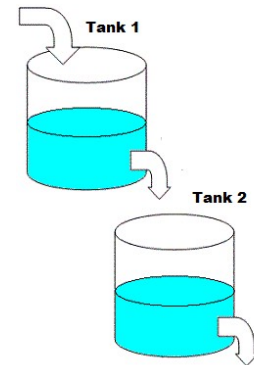


1.5 Exercises

Problem 1 Consider the cascade of two tanks shown, with $V_1 = 100$ (gal) and $V_2 = 200$ (gal) representing the volumes of solution (salt water) in the two tanks. Dissolved in the water of each tank is 50 lb of salt. The three flow rates indicated in the figure are each 5 gal/min, with pure water flowing into tank 1.



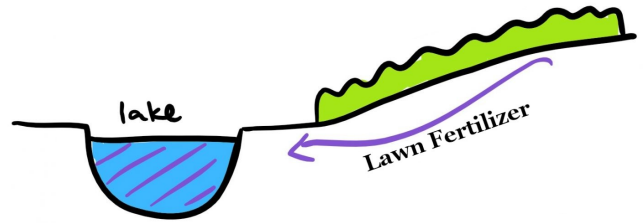
a) Find the amount of salt in tank 1 at time t , represented as $x(t)$.

b) Suppose that $y(t)$ represents the amount of salt in tank 2 at time t . Solve for $y(t)$.

c) Finally, find the maximum amount of salt ever in tank 2.

Note: Shortcut to explicit solution to DEQ: $y = \frac{1}{\rho} \int \rho Q dx$.

Problem 2 Consider a lake with a volume of 8 billion cubic feet (ft^3) and an initial pollutant concentration of 0.25%. There is a daily inflow of 500 million ft^3 of water with a pollutant concentration of 0.05% and an equal daily outflow of the (well-mixed) water in the lake. How long will it take to reduce the pollutant concentration in the reservoir to 0.10%?



Problem 3 Find the general solution of: $y' = 2xe^{-3x} - 3y$.