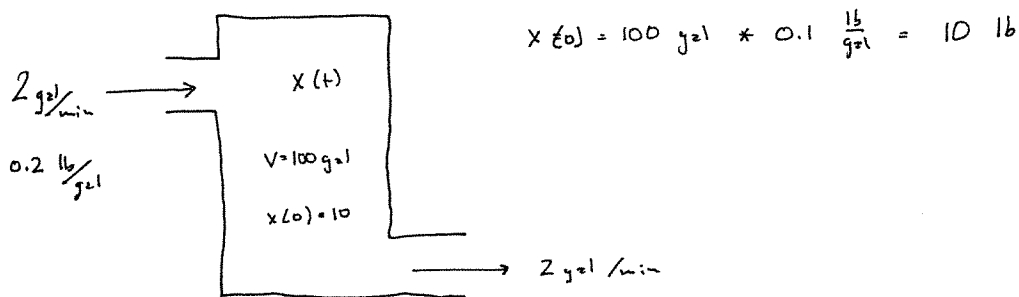


1. 8 A 100 gallon tank contains a brine mixture with concentration 0.1 pounds of salt per gallon. A brine mixture of concentration 0.2 pounds of salt per gallon is flowing in at a rate of 2 gal/min. The tank is well mixed and the resulting mixture is flowing out at 2 gal/min. Find the amount of salt in the tank as a function of time.



$$\frac{dx}{dt} = 2(0.2) - \frac{x}{100}(2) = \frac{2}{5} - \frac{x}{50} = \frac{20-x}{50}$$

$$\int \frac{dx}{20-x} = \int \frac{dt}{50}$$

$$-\ln|20-x| = \frac{1}{50}t + C$$

$$20-x = Ce^{-t/50}$$

$$x = 20 - Ce^{-t/50}$$

$$x(0) = 10 \quad \text{so} \quad C = 10$$

$$x(t) = 20 - 10e^{-t/50}$$

2. 2 Set up an initial value problem for the tank described above if the flow out is increased to 4 gal/min. Do Not Solve.

$$\frac{dx}{dt} = 2(0.2) - \left(\frac{x}{100-2t}\right)(4), \quad x(0) = 10$$