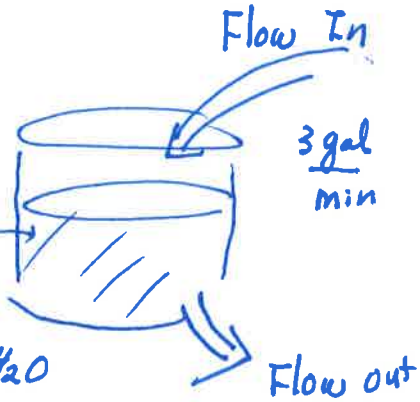
① Notes.



- Rate of change amount of salt $\left(\frac{lb}{min}\right)$

$= \left(\text{Constration of salt}\right) \cdot \left(\text{Flow Rate}\right)$

$\left(\frac{lb}{gal}\right) \cdot \left(\frac{gal}{min}\right) = \left(\frac{lb}{min}\right)$

- Rate of change amount of salt in the tank : $\left(\frac{dS}{dt}\right)$

$\Rightarrow \left[\begin{matrix}\text{Amount of Salt} \\ \text{Flow in /min}\end{matrix}\right] - \left[\begin{matrix}\text{Amount of Salt} \\ \text{Flow out /min}\end{matrix}\right]$

$\Rightarrow$ DE : $\frac{dS}{dt} = 6 - \left(\frac{2\,S(t)}{50+t}\right)$ $\qquad S' + P(t)\cdot S = Q(t)$

$\Rightarrow S' + \left(\frac{2}{50+t}\right)\cdot S = 6$

$P = \frac{2}{50+t} \Rightarrow I(t) = e^{\int \frac{2}{50+t}\,dt} = e^{2\ln(50+t)}$

$= (50+t)^2$

$(50+t)^2 \cdot S' + 2(50+t)\cdot S = 6(50+t)^2$

$\frac{d}{dt}\left[S(50+t)^2\right] = 6(50+t)^2$

$\int d\left[S(50+t)^2\right] = \int 6(50+t)^2\,dt$

$\Rightarrow S(50+t)^2 = 2(50+t)^3 + C$

$t = 0 \qquad S = 20$

(2)

$$20(50)^2 = 2(50)^3 + C$$

$$C = 20(50)^2 - 2(50)^3$$

$$= 2(50)^2[10 - 50)$$

$$= -80(50)^2$$

$$S(50+t)^2 = 2(50+t)^3 - 80(50)^2$$

$$S_{(t)} = 2(50+t) - 80(50)^2(50+t)^{-2}$$

$t = 60$ min.

$$S(60) = 2(50+60) - 80(50)^2(50+60)^{-2}$$

$$\approx 203. \text{ lbs}$$