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MECHANICAL ENGINEERING
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$\frac{dy}{dt} = y_{in} - y_{out}$

50gal containing (1+2sin t) lb salt where $t = 1$

$= 1 + 2\sin(1) = 1.02$ lb salt

50 gal $= 50 \times \frac{1.02}{} = 51$ lb

1200gal of water which 50gal leaves per min $= \frac{50}{1200} = 0.025 = 2.5\%$

$y_{out} = 2.5\%$ of y

$\therefore \left(\frac{dy}{dt}\right)_{min} = \frac{51 lb}{min} - 2.5\% \text{ of } y \frac{lb}{min}$

$\frac{dy}{dt} = 51 - 0.025y = -0.025y + 51$

$\frac{dy}{dt} = -0.025\left[\frac{-0.025y}{-0.025} + \frac{51}{-0.025}\right]$; $\frac{dy}{dt} = 0.025(y - 2040)$

$\frac{dy}{(y-2040)} = 0.025\,dt$

$\therefore \int \frac{dy}{(y-2040)} = \int 0.025\,dt \Rightarrow \ln(y-2040) = 0.025t + c$

$y - 2040 = e^{-0.025t + c}$

$y - 2040 = e^{-0.025t} e^{c}$

$y - 2040 = e^{-0.025t} y_0$

$y - 2040 = y_0 e^{-0.025t}$

$y = y_0 e^{-0.025t} + 2040$

Given that when $t = 0$

$\therefore y = 150$ lb (Initially $y = 150$ lb)

$150 = y_0 e^{-0.025(0)} + 2040$

$150 - 2040 = y_0 \times 1$

$y = -1890$

Then

$y = -1890 e^{-0.025t} + 2040$