

Here $t=0$ $y=100$

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① Using Balance Law

$$\left. \begin{array}{l} \text{Accumulation} \\ \text{rate of salt} \\ \text{within system} \end{array} \right\} = \left. \begin{array}{l} \text{Input rate of} \\ \text{salt into} \\ \text{system} \end{array} \right\} - \left. \begin{array}{l} \text{Output rate of} \\ \text{salt from} \\ \text{system} \end{array} \right\}$$

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

Since 50 gals enter per minute and one gallon contains 1 lb salt
Therefore $y_{in} = 50(1+5y)$

The tank contains 100 gallons of water with 100 lbs salt dissolved in it. The tank contains 200 gallons of water with 100 lbs salt dissolved in it. The tank contains 200 gallons of water with 100 lbs salt dissolved in it. The tank contains 200 gallons of water with 100 lbs salt dissolved in it.

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$$\frac{dy}{dt} = 50(1+5y) - 0.025y$$

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$$\frac{dy}{dt} + 0.025y = 50(1+5y)$$

$$\frac{dy}{dt} + 0.025y = 50 + 250y \quad (1)$$

$$\int 5e^{0.025t} \sin t \, dt = -e^{0.025t} \cos t + 0.025 \int e^{0.025t} \cos t \, dt$$

$$U = e^{0.025t}$$

$$du = 0.025e^{0.025t}$$

$$= -e^{0.025t} \cos t + 0.025 \int e^{0.025t} \cos t \, dt$$

$$\int e^{0.025t} \cos t \, dt = \frac{1}{0.025} \int e^{0.025t} \cos t \, dt$$

$$\text{Let } I = \int e^{0.025t} \sin t \, dt$$

$$I = -e^{0.025t} \cos t + 0.025 \int [e^{0.025t} \sin t - 0.025t] \, dt - (x \cdot y)$$

$$I = -e^{0.025t} \cos t + 0.025e^{0.025t} \sin t - 0.000625t - (x \cdot y)$$

$$I + 0.000625t = -e^{0.025t} \cos t + 0.025e^{0.025t} \sin t - (x \cdot y)$$

$$I = \frac{e^{0.025t}}{1.000625} (0.025 \sin t - \cos t) + C - C(x \cdot y)$$

Recall that $I = \int e^{0.025t} \sin t \, dt$ Sub Eqn (xvii) in (vi)

$$I = \frac{50 e^{0.025t}}{0.025} + \frac{50 e^{0.025t}}{1.000625} (0.025 \sin t - \cos t) + 50$$

div. 6 through to $e^{0.025t}$ $C = y$

$$y = \frac{50}{0.025} + 50 \frac{(0.025 \sin t - \cos t)}{1.000625} + \frac{50y}{e^{0.025t}} (x \cdot y)$$

Given $t=0$ $y=150$

$$150 = 2000 + 49.969 (0-1) + 50y$$

$$y = \frac{-2000 + 49.96\% + 150}{50}$$

$$y = -36.0006 \text{ S}$$

Substituted in eqn (iii)

$$y = \frac{50}{0.025} + 50 (0.025 \sin t - \cos t) + \frac{50x - 36.0006}{e^{0.025t}}$$

$$y = 2000 + 49.969 (0.025 \sin t - \cos t) = \frac{1800.031}{e^{0.025t}}$$

Time Answer

$$y = 2000 + 49.969\% (0.025 \sin t - \cos t) =$$

$$\frac{1800.031}{e^{0.025t}}$$

if Amount of sales at time t is $m \dots$

$$m = 2000 + 49.969 (0.025 \sin t - \cos t) = \frac{1800.031}{e^{0.025t}}$$