

Litu 8

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$$\textcircled{1} \quad y' = e^{t-y} \Rightarrow y \cdot y' = \frac{e^t}{e^y} \Rightarrow e^y \cdot y \cdot y' = e^t$$

$$\text{Logo, } \int e^y \cdot y \, dy = \int e^t \, dt \Rightarrow \left[ e^y \cdot y - e^y = e^t + C \right]$$

$$\textcircled{2} \quad y' + ay = bt + c, \quad y(0) = d$$

Logo

$$\int (y' + ay) \, dy = \int (bt + c) \, dt \Rightarrow \frac{ay^2}{2} + y + c = \frac{bt^2}{2} + ct + c_2$$

Por fim

$$\frac{a \cdot 0^2}{2} + 0 + c = \frac{a d^2}{2} + d + c \Rightarrow \frac{a d^2}{2} + d = (c - c_2) \Rightarrow \frac{ay^2}{2} + y = \frac{bt^2}{2} + ct + \frac{ad^2}{2} + d$$

$$\Rightarrow \left[ ay^2 + 2y = bt^2 + 2ct + ad^2 + 2d \right]$$

③

$$a) \text{ Como } V(t) = V_0 + at, \Rightarrow V(t) = 20 + 10t - 8t$$

$$\text{Logo, isso, o transbordamento ocorre em } 20 + 10t - 8t > 100 \Rightarrow t > 20,$$

$$b) \text{ Como } q(t) \text{ representa a taxa de saída no tempo, como chega } 240 \text{ g/min e sai } q \text{ g/min,}$$

$$\text{então } q(t) = 240 - q$$

12,5

$$c) \text{ Como transborda em } t = 20, \text{ então}$$

$$\frac{q'}{12,5} + q = 240 \text{ com } q(0) = 0 \Rightarrow q' = \frac{-2}{25} (q - 3000) = -2 \left( \frac{q}{25} - 120 \right)$$

Logo,

$$2q(t)$$

$$\frac{2t}{25} \Rightarrow -2t + C \Rightarrow \left[ q(t) = 3000 - 3000 e^{(-0,08t)} \right]$$

$$q(t) = 120$$

25

④

$$a) 2v = -kA \Rightarrow v' = -k(36\pi)^{1/3} \cdot v^{2/3} \quad \text{com } v(0) = v_0$$

2t

$$\text{Portanto, } v' v^{3/2} = -k(36\pi)^{1/3} \quad \text{onde } -k(36\pi)^{1/3} = \text{constante}$$

$$b) \int v^{3/2} 2v = \int -k(36\pi)^{1/3} 2t \Rightarrow c = \frac{2}{5} v_0^{5/2}$$

$$\text{Portanto, } v^{5/2} = -\frac{5}{2} k(36\pi)^{1/3} t + v_0^{5/2}$$

c)

$$0 = -\frac{5}{2} k(36\pi)^{1/3} t + v_0^{5/2} \Rightarrow t = \frac{2 v_0^{5/2}}{5 k(36\pi)^{1/3}}$$