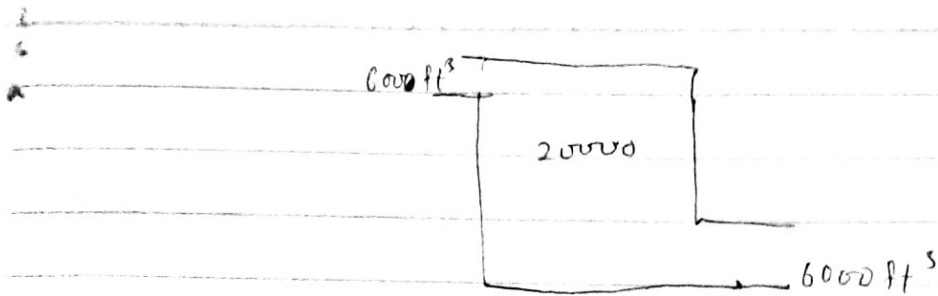


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ENG 282



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

$$y_{in} = 600$$

$$y_{out} = \frac{600}{20000} = 0.03y$$

$$\frac{dy}{dt} = 600 - 0.03y$$

$$\frac{dy}{dt} = 600 - 0.03(y - 20000)$$

$$\int \frac{dy}{(y - 20000)} = \int -0.03 dt$$

$$\ln(y - 20000) = (-0.03t) + c$$

a) $y = 0 \Rightarrow y - 20000 = e^{-0.03t}$

$$y = y_0 e^{-0.03t} + 20000$$

$$= y_0 e^{-0.03(0)} + 20000$$

$$= y_0 = -20000$$

$$y = -20000 e^{-0.03t} + 20000$$

b) $90\% \times 20000 = 18000$

$$y = 18000$$

$$18000 = -20000 e^{-0.03t} + 20000$$

$$18000 - 20000 = -20000 e^{-0.03t}$$

$$0.1 = e^{-0.03t}$$

$$\ln(0.1) = -0.03t$$

$$t = -2.30 (-0.03)$$

$$t = 76.8 \text{ min}$$