

IBEN VECTOR .S.  
 Mechanical Engineering  
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 PNE 282



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

~~$y_{out} =$~~   $y_{in} = 600$   
 $y_{out} = \frac{600}{200} = 0.03y$

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

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

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

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

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

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

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

a (a)  $t = 0$  ;  $y = 0$

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

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

$$y_0 = -20000$$
$$y = 20000 e^{-0.03t} + 2000$$

b 90% of 20000 = 18000

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

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

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

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

$$t = \frac{-2.30}{0.03}$$

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