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Mechatronics Engineering

Answer

$$(a) \frac{dy}{dt} = ky$$

$$\int \frac{1}{y} dy = \int k dt$$

$$\ln y = kt + C$$

$$y = e^{kt+C}$$

$$y = e^{kt} \cdot e^C$$

$$\text{let } e^C = y_0$$

$$y = y_0 \cdot e^{kt}$$

But $y_0 = dy_0$ and $t = 5 \text{ hrs}$

$$dy_0 = y_0 \cdot e^{5k}$$

$$\ln d = 5k$$

$$k = \frac{\ln d}{5} = \frac{\ln 2}{5}$$

$$= 0.139$$

$$y = y_0 e^{0.139t}$$

24 hours = 1 day

$$x = 1/2 \text{ day}$$

$$x = 24 \times 1.5 = 36$$

where $y_0 = 20$ and $t = 36$

$$y = 20e^{0.139 \times 36}$$

$$y = 2980.2$$