

1a) $\frac{dy}{dt} = Ky$

$$\frac{dy}{y} = K dt$$

$$\ln y = Kt + C$$

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

$$\therefore y = e^{Kt} \cdot e^C$$

Then $y = y_0 e^{Kt}$

but ; $y = 2y_0$, when $t = 5 \text{ hrs}$

$$2y_0 = y_0 e^{Kt}$$

$$\ln 2 = 5K$$

$$K = \frac{\ln 2}{5}$$

$$K = 0.139$$

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

b) Since $24 \text{ hrs} = 1 \text{ day}$

$$x = 1.5 \text{ days}$$

$$\therefore x = 24 \times 1.5$$

$$x = 36 \text{ hours.}$$

where $y_0 = 20$, $t = 36 \text{ hours.}$

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

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

$$y = 2980.2 \approx 2980 \text{ bacteria.}$$