Feyisola Oluwatimilehin
16/ENG02/019.
Computer Engineering.
ENG 282.

1.)

$\frac{dy}{dt} = Ky$

$\frac{1}{y} dy = K dt.$

$\int \frac{1}{y} dy = \int K dt.$

$\ln y = Kt + c$

$y = e^{Kt+c}$

$y = e^{Kt} \cdot e^{c}$

let e^c be c ~~constant~~

$y = e^{Kt} \cdot c$

$y = Ce^{Kt}.$

But at $t = 0$, $y = 20$

Sothat;

$20 = Ce^{K(0)}$

$20 = Ce^{0}$

$20 = C$

$C = 20.$

Therefore $y = 20e^{Kt}$

When y doubles every 5hours (at $t = 5$, $y = 40$)

$40 = 20e^{K(5)}$

$\frac{40}{20} = e^{5K}.$

$e^{5K} = 2$

$5K = \ln 2.$

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

$K = 0.1386.$

Therefore: the model is

$y = 20e^{0.1386t}.$

b.) To express $1\frac{1}{2}$ days in hours

24 hrs = 1 day

$1\frac{1}{2}$ days = 36 hrs.

Therefore substituting values in model we have; $y = 20e^{0.1386(36)}$

$y = 20e^{4.9896}$

$y = 20 \times 146.8777$

$y = 2937.554.$

At $y = 10$, 30 & 50.

at $t = 0$, $y = 10$

$10 = Ce^{K(0)}$

$10 = Ce^{0}$

$10 = C.$

Also since y doubles every 5 hours

$20 = 10e^{5K}$

$\frac{20}{10} = e^{5K}.$

$e^{5K} = 2$

$5K = \ln 2$

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

$K = 0.1386$ $\quad 0.1386t.$

For $y=30$

$t=0,\ y=30$

$30=Ce^{k(0)}$

$30=Ce^{0}$

$30=C.$

Also since y doubles every 5hrs

$60=30^{k+5c}$

$\frac{60}{30}=e^{5k}.$

$e^{5k}=2$

taking ln of both sides

$5k=\ln 2$

$k=\frac{\ln 2}{5}=0.1386$

$y=30e^{0.1386t}$

For $y=50$

at $t=0$

$50=Ce^{k(0)}$

$50=C$

$100=50e^{5k}$

$\frac{100}{50}=e^{5k}.$

$5k=\ln 2$

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

$k=0.1386$

$y=50e^{0.1386t}$