16) $\frac{dy}{dt} = 100 - y \Rightarrow \frac{1}{100-y}\,dy = dt$

$u = 100 - y$

$du = -dy$

$-\int \frac{1}{u}\,du$

$-\ln|u|$

$-\ln|100-y| = t + C_1$

$\ln|100-y| = C_2 - t$

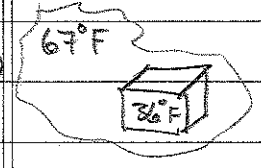
$|100-y| = e^{C_2}e^{-t} = C_3 e^{-t}$

$100 - y = C_4 e^{-t}$

$y = 100 - C_4 e^{-t}$

if $y(0) = 10 = 100 - C_4(1)$, $C_4 = 90$, $y = 100 - 90e^{-t}$ A

if $y(0) = 135$ " $C_4 = -35$ $y = 100 + 35e^{-t}$ vs

17) 

let H = heat/energy/temp

Newtons law of cooling/heating: the rate of change $\left(\frac{dH}{dt}\right)$ of a body is proportional to the difference between the temperature of the body & its surroundings

A) $\boxed{\frac{dH}{dt} = k(H-67)}$

$\frac{1}{H-67}\,dH = k\,dt$

$\ln|H-67| = kt + C_1$

$|H-67| = e^{kt}e^{C_1} = C_2 e^{kt}$

$H - 67 = C_3 e^{kt}$

B $\boxed{H = C_3 e^{kt} + 67}$

$H(0) = 36 = C_3 e^{0} + 67$

$\boxed{C_3 = -31}$

$\boxed{H(t) = 67 - 31e^{kt}}$

$\boxed{\frac{dH}{dt} = k(67-H)}$

$\frac{1}{67-H}\,dH = k\,dt$

$+\ln|67-H| = -(kt + C_1) = C_2 - kt$

$|67-H| = e^{C_2}e^{-kt} = C_3 e^{-kt}$

$67 - H = C_4 e^{-kt}$

$\boxed{H = 67 - C_4 e^{-kt}}$

$H(0) = 36 = 67 - C_3 e^{0}$

$\boxed{C = 31}$

$\boxed{H(t) = 67 - 31e^{-kt}}$

c) @ $t = 4$

$\boxed{H(4) = 67 - 31e^{\ln\left(\frac{24}{31}\right)(4)}}$

$H(1) = 43 = 67 - 31e^{k}$

$31e^{k} = 24$

$e^{k} = 24/31$

$k = \ln\left(\frac{24}{31}\right) \Rightarrow \boxed{H(t) = 67 - 31e^{\ln\left(\frac{24}{31}\right)t}}$

$H(1) = 67 - 31e^{-k} = 43$

$-31e^{-k} = -24$

$e^{-k} = \frac{24}{31}$

$-k = \ln\left(\frac{24}{31}\right) \Leftarrow k = -\ln\left(\frac{24}{31}\right)$