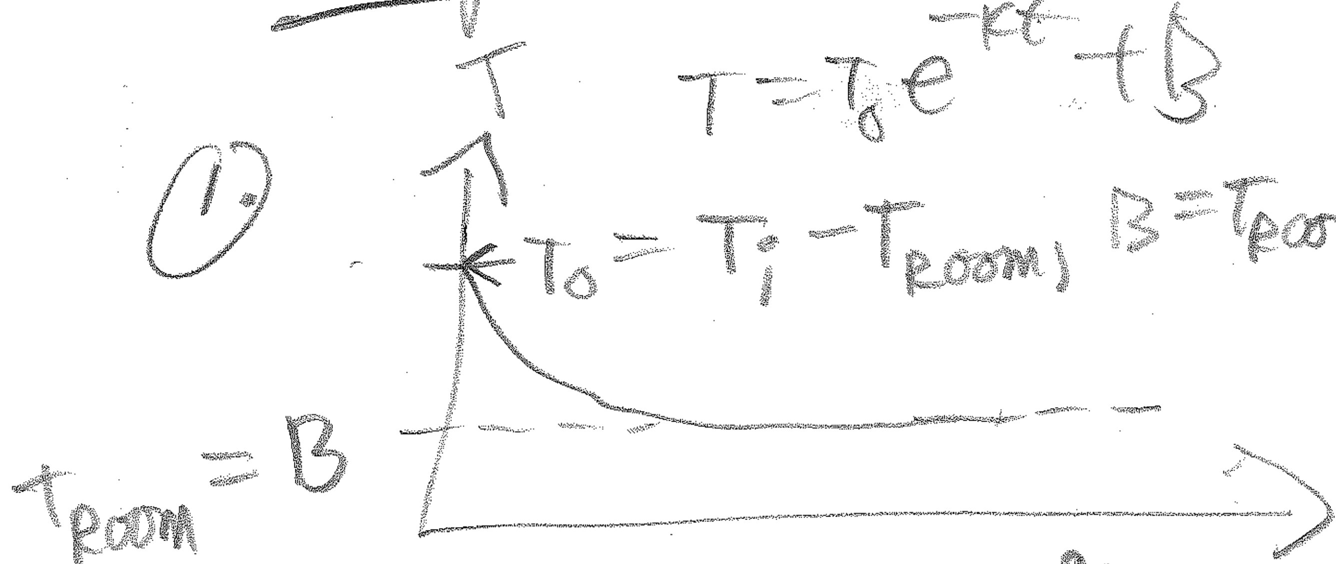
11-19-13

Analysis cooling Lab

$T = T_0 e^{-kt} + B$

(1.)



$T_0 = T_i - T_{ROOM}$, $B = T_{ROOM}$

(2.) $A = T_0 = T_i - T_{ROOM}$

T_i ← 50°C (HOT WATER)

T_{ROOM} ← 24°C

$C = K$ (MIN^{-1})

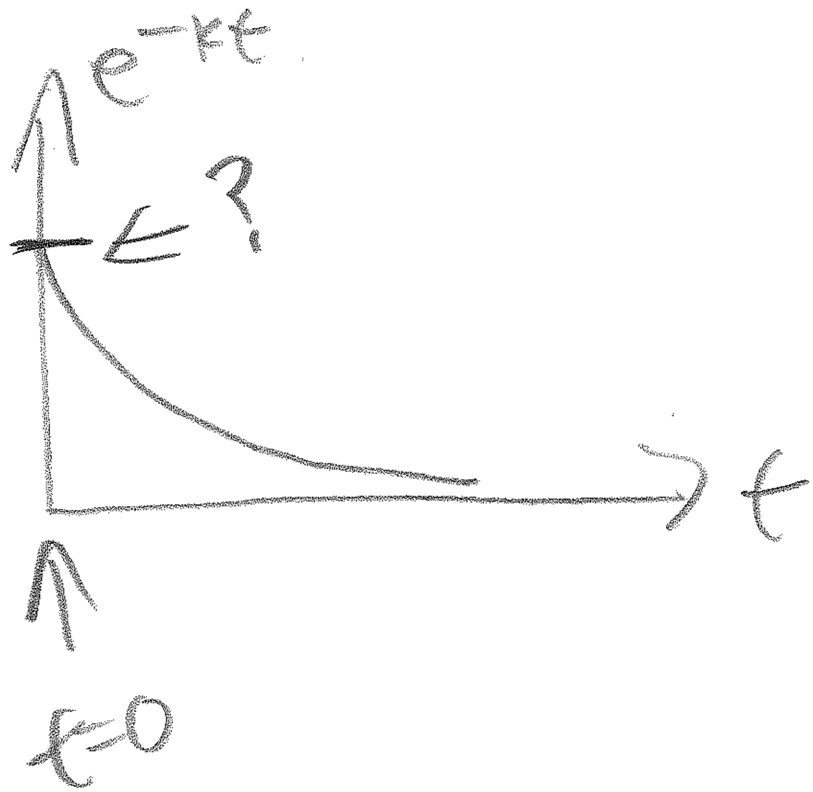
$B = T_{ROOM}$ (°C)

(3.) compare B with T_{ROOM}

$$P.E. = \left| \frac{B - T_{ROOM}}{T_{ROOM}} \right| \times 100\%$$

(4) $e^{-kt} = ?$

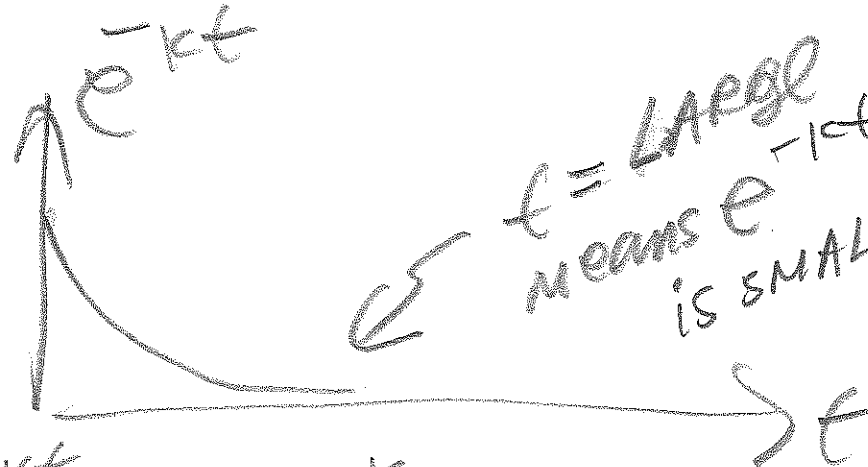
when $t = 0$;
look it up on internet
OR OLD TEXTBOOK.



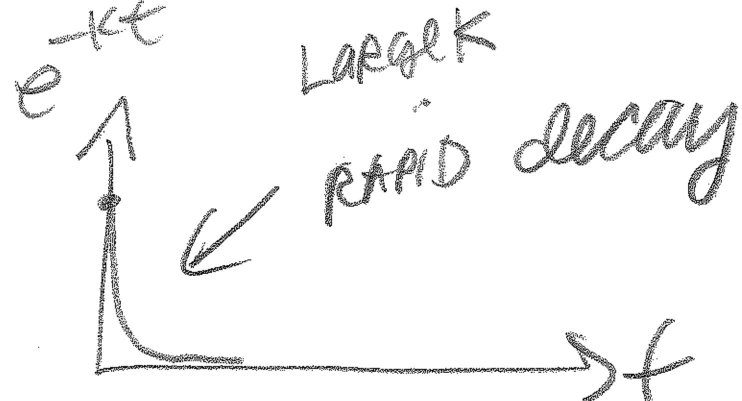
(5.)

$$T = T_0 e^{-kt} + B \leftarrow T_{ROOM}$$

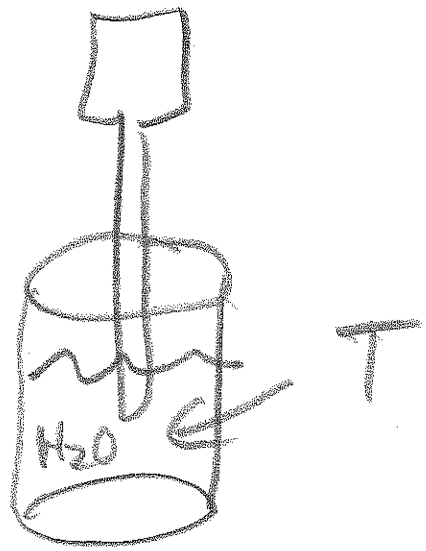
$$T_0 = T_i - T_{ROOM}$$



(6.)



(6)



physically, what can you do to make decay of T very gradual.

(7.)

$$T_0 e^{-kt} + B$$

plug in $t = \frac{800}{60}$ (min)

(6)

$$T = T_0 e^{-kt} + B \leftarrow T_{room}$$

$$T = (T_i - T_{room}) \cdot e^{-kt} + T_{room}$$

$$T = T_{room} + 1°C$$

$$T_{room} + 1 = (T_i - T_{room}) e^{-kt} + T_{room}$$

$$1 = T_0 e^{-kt}$$

$$\ln 1 = \ln(T_0 \cdot e^{-kt})$$

$$\frac{1}{T_0} = e^{-kt}$$

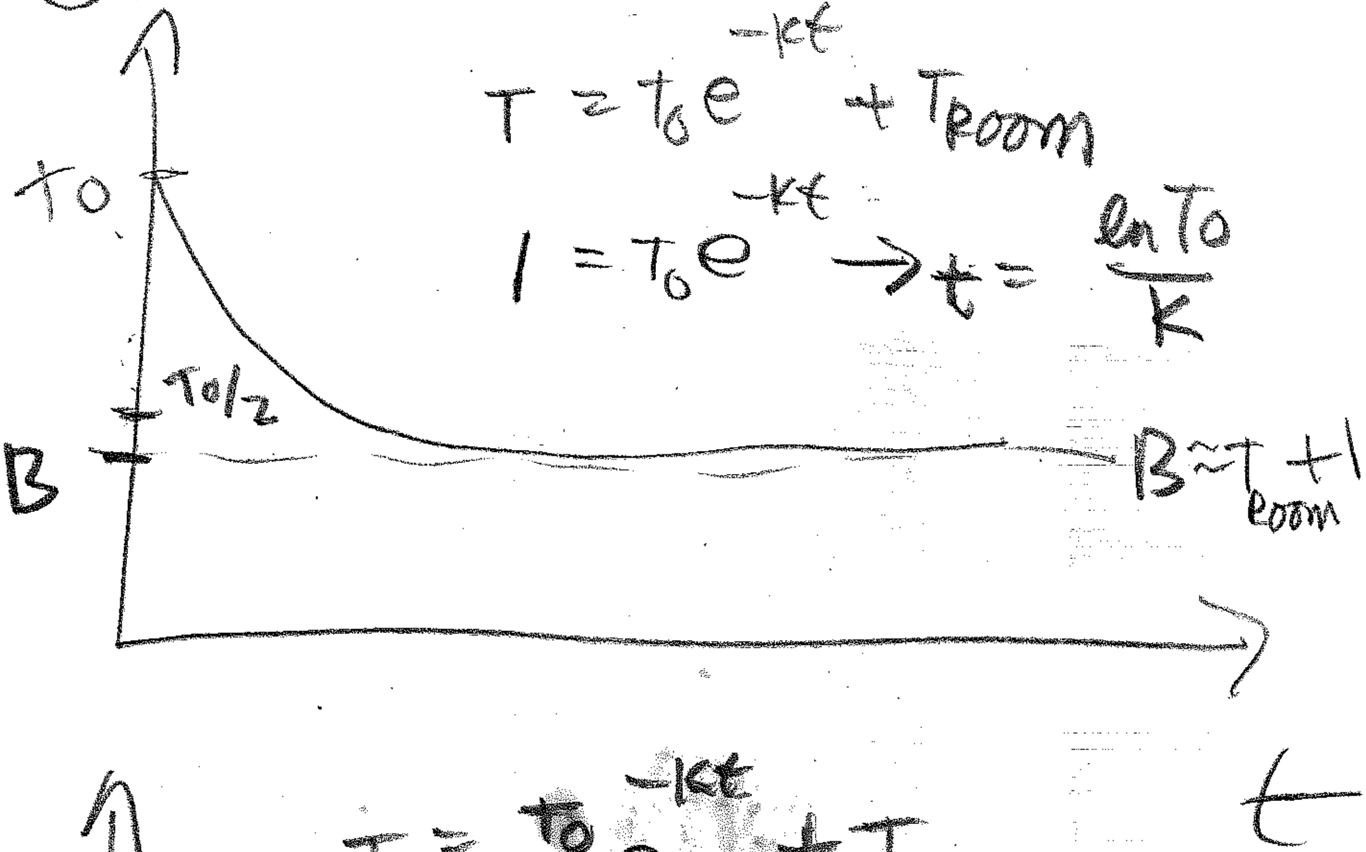
(a) $$\ln\frac{1}{T_0} = -kt$$

$$\Rightarrow kt = \ln T_0$$

$$t = \frac{\ln T_0}{K}$$

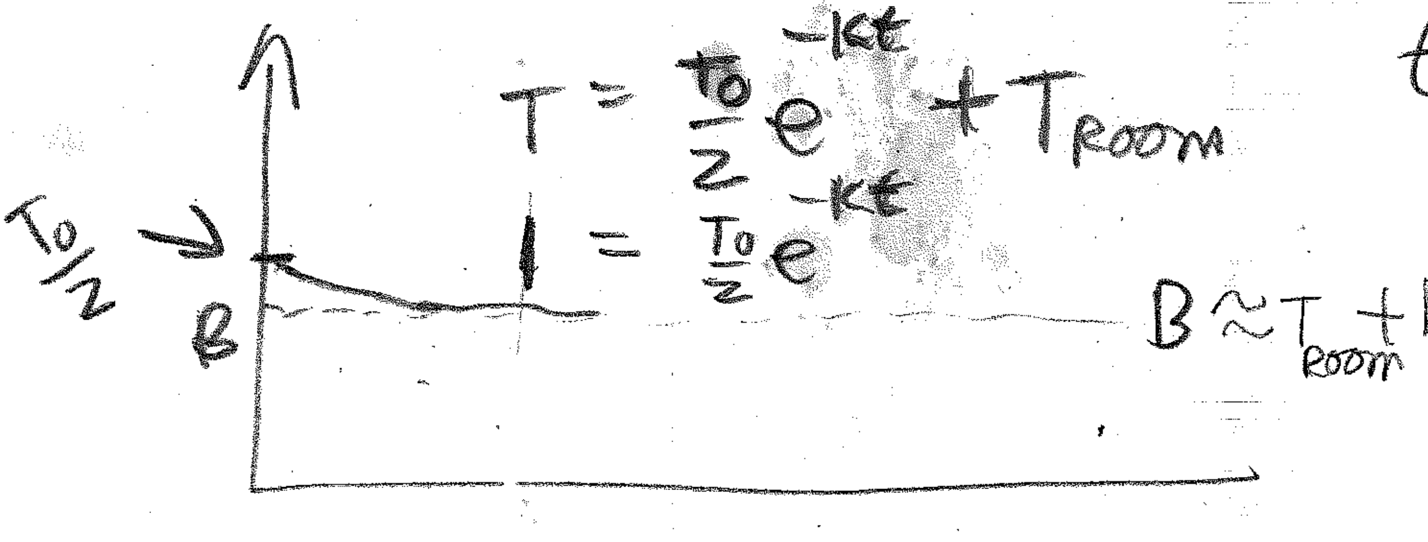
$K = C$ from # 2

(a)



$$T = T_0 e^{-kt} + T_{ROOM}$$

$$1 = T_0 e^{-kt} \rightarrow t = \frac{\ln T_0}{K}$$



$$T = \frac{T_0}{2} e^{-kt} + T_{ROOM}$$

$$1 = \frac{T_0}{2} e^{-kt}$$

$$1 = \frac{T_0}{2} e^{-kt} \rightarrow t = \frac{\ln\left(\frac{T_0}{2}\right)}{K}$$

$$\ln \frac{2}{T_0} = -kt$$