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COLLEGE - ENGINEERING
DEPARTMENT - MECHANICAL
LEVEL - 200
COURSE - ENG282
MAT NO - 17/ENG06/1029

1a

Mathematical modelling is a mathematical representation of a system and simultation of a system which involves acting the model and obtaining the output variable for different values of its input variable or as input variable is changed from one value to another.

b

i Differentiating.

ii

c

$T(0) = 10^{\circ}C$.

$T(5) = 20^{\circ}C$.

Actual temp $= 25^{\circ}C = T_n$.

$$\frac{\partial T}{\partial t} = k(T - T_n)$$

$$\partial T = k(T - T_n)\partial t$$

$$\frac{\partial T}{(\partial - T_n)} = k\partial t.$$

Integrating both sides

$$\ln(T - T_n) = kt + c$$

$$T - T_n = e^{kt} + e^{c}.$$

Let e^{c} be A.

$$T - T_n = e^{kt} * A.$$

$$T T_n = A e^{kt}$$

$$T = A e^{kt} + T_A.$$

Insert = 25-(15*exp[-0.22*A2)].

- Auto fill
- Go to insert

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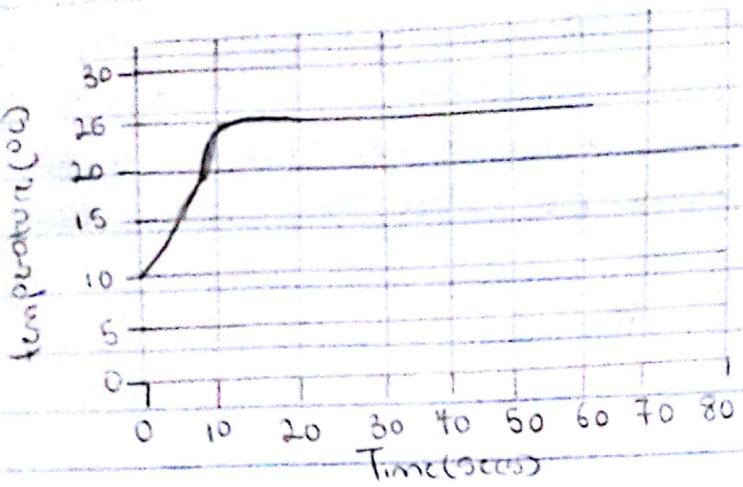
Pick a graph of choice.
Label the graph

Output



Using matlab

Command window

```
clear
clc
close all
t=0:1:60
T= 25-15*exp(-0.22*t)
Plot(t,T)
grid on
grid minor
xlabel('Time(secs)')
Ylabel('Temperature')
grid on
grid minor
```

when T=10.

$10 = Ae^{-k(10)} + 25$

$10 = A + 25$

$A = 15$.

$T = 25 - 15e^{-kt}$

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At $t(s) = 20$

$20 = 25 - 15e^{-k(s)}$

$20 - 25 = -15e^{-k(s)}$

$15e^{-k(s)} = 25 - 20$.

$15e^{-5k} = 5$

$e^{-5k} = 0.3333$.

$-5k = \ln 0.3333$

$-5k = -1.0986$.

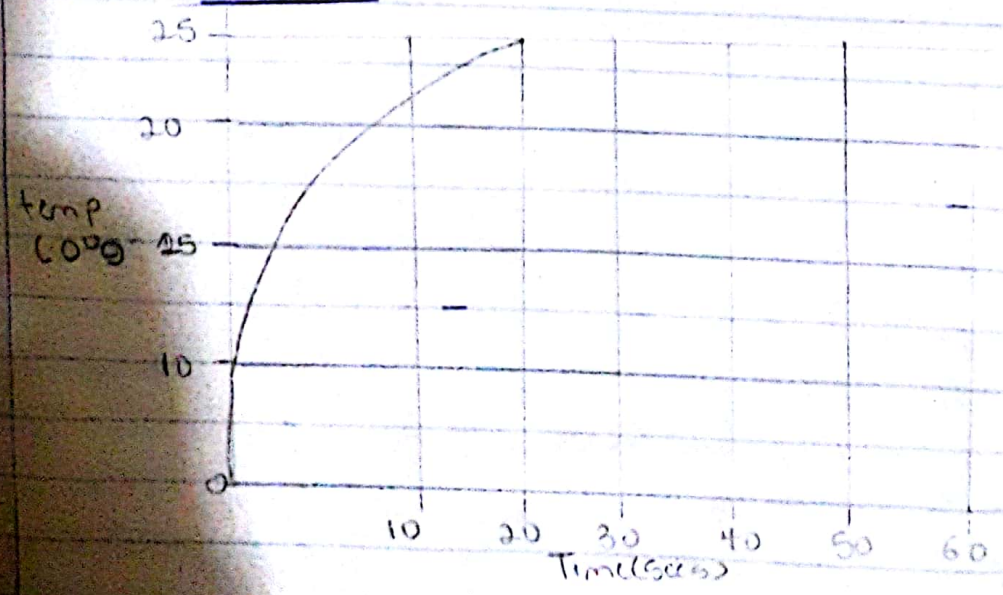
$k = 0.22$.

$T(t) = 25 - 15e^{-0.22t}$ Relating equation

ii. Using microsoft excel

- Pick a box insert 't'
- Pick another box insert 'T'
- Undo the already labelled box 't'
- Insert a value of 0 in an empty box.
- Go to fill
- Adjust lack on series.
- Insert a step value of 1
- Change series in to column.
- Insert a stop value of 60.
- Under the already labelled box 2 (t)
- Pick a box.

Output



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iv Using excel's dynamic response, the steady state temperature of the system would be 25°C at 20 mins.

v Using the developed model's equation, the temperature of the thermometer at $t=0$ will be 25°C.

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