

Wing 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

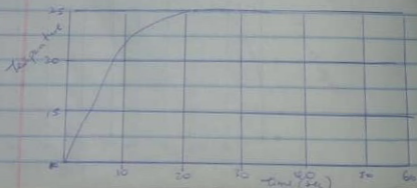
x label ('Time (sec)')

y label ('Temperature')

grid on

grid minor

Output



$$T = Ae^{kt} + T_a$$

$$\text{When } T = 10$$

$$10 = Ae^{k(0)} + 25$$

$$10 = A + 25$$

$$A = 10 - 25$$

$$A = -15$$

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

$$\text{At } t(t) = 20$$

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

$$20 = 25 - 15e^{kt}$$

$$15e^{kt} = 25 - 20$$

$$15e^{kt} = 5$$

$$e^{kt} = 0.3333$$

$$kt = \ln 0.3333$$

$$-kt = -1.0986$$

$$k = -0.22$$

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

ii Using Microsoft Excel

• Pick a box input 't'

• Pick another box input 'T'

• Under the already labelled box 't'

a. Mathematical modelling is a mathematical representation of a system and simulation of a system which involves solving the model and obtaining its output variable for different values of its input variables.

b. - Differentiating

- Use of Balance law

c. $T_{(0)} = 10^{\circ}\text{C}$

$$T_{(5)} = 20^{\circ}\text{C}$$

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

$$\frac{dT}{dt} = k(T - T_a)$$

$$dT = k(T - T_a) dt$$

$$\frac{dT}{(T - T_a)} = k dt$$

$$\int \frac{dT}{(T - T_a)}$$

Integrating both sides

$$\ln(T - T_a) = kt + C$$

$$T - T_a = e^{kt} + e^C$$

$$\text{Let } e^C \text{ be } A$$

$$T - T_a = e^{kt} \cdot A$$

$$T - T_a = A e^{kt}$$

- Insert a value of 0 in empty box
- Go to fill
- Adjust click on Series
- Insert a step value of 1
- Change the series in to columns
- Insert a stop value of 60
- Under the already labelled box 2
- Pick a box
- Insert $\sigma = 25 \cdot (1 + \exp(-0.22 \cdot t))$
- Auto fill
- Go to insert
- Pick a graph of choice
- Label the graph

