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 17/ENIG02/019
 COMPUTER ENGINEERING

ENG 282: Eng - Math Assignment V

a) Mathematical modelling is a process that uses mathematical structures - graphs, diagrams, scattered plots to represent real world situations

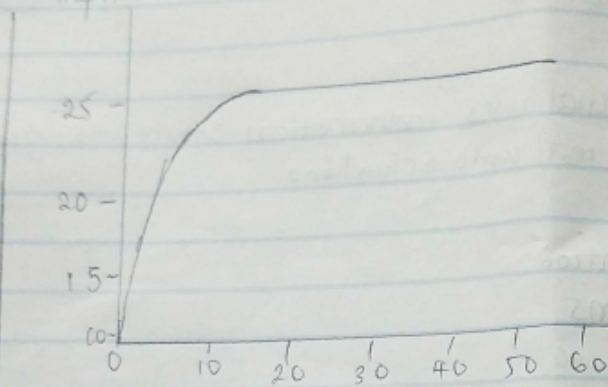
b) ~~Introduction to~~ Differential Equation
~~Introduction to~~ Dynamic Systems

c) $T_{(0)} = 10^\circ\text{C}$
 $T_{(5)} = 20^\circ\text{C}$
 Input = 25°C
 $\frac{dT}{dt} = k(T - T_a)$
 $\frac{dT}{T - T_a} = k dt$
 $\int \frac{dT}{T - T_a} = \int k dt$
 $\ln(T - T_a) = kt + c$
 $T - T_a = e^{kt} \cdot e^c$
 $A = e^c$
 $T - T_a = Ae^{kt}$
 $T = Ae^{kt} + T_a$
 at $T_{(0)} = 10^\circ\text{C}$
 $10 = Ae^{k(0)} + 25$
 $10 = A(1) + 25$
 $10 = A + 25$
 $10 - 25 = A$
 $-15 = A$
 $\therefore A = -15^\circ\text{C}$
 $T(t) = 25 - 15e^{kt}$
 at $T_{(5)} = 20^\circ\text{C}$
 $20 = 25 - 15e^{k(5)}$

$20 = 25 - 15e^{5k}$
 $15e^{5k} = 25 - 20$
 $15e^{5k} = 5$
 $e^{5k} = \frac{5}{15}$
 $e^{5k} = 0.333$
 $5k = \ln(0.333)$
 $5k = -1.099$
 $k = \frac{-1.099}{5}$
 $k = -0.2198$
 ~~$k = -0.22$~~
 ~~$k = -0.22$~~
 $\approx k = -0.22$
 $T(t) = 25 - 15e^{-0.22t}$

ii) t	T
0	$25 - 15 \cdot \text{Exp}(-0.22 \times 0) = 10$
1	$25 - 15 \cdot \text{Exp}(-0.22 \times 1) = 12.96222$
2	$25 - 15 \cdot \text{Exp}(-0.22 \times 2) = 15.33945$
58	$25 - 15 \cdot \text{Exp}(-0.22 \times 58) = 24.99996$
59	$25 - 15 \cdot \text{Exp}(-0.22 \times 59) = 24.99997$
60	$25 - 15 \cdot \text{Exp}(-0.22 \times 60) = 24.99997$

Graph obtained



iii Command window

clear

clc

close all

t = [0:1:60]

T = 25 - 15 * exp(-0.22 * t)

plot (t, T)

iv The steady state temperature of the system is 25°C

v Temperature of the thermometer as $t \rightarrow \infty = 25^{\circ}\text{C}$.