Mathematical Modelling is the process of developing Mathematic Mod... which descriptions of Systems Using Mathematical concepts an... language.

There are two Main Categories of Mathematical Modelling

- **Theoretical Modelling**: when modelling the Suspension of a ...
- **Experiment Modelling**:

$$\frac{dT}{dt} \propto (T - T_A) \qquad T_A = \text{actual Temperature}$$

$$dT/dt = K(T - T_A)$$

- Collect like terms

$$\frac{dT}{(T - T_A)} = Kdt$$

Integrate both Sides

$$\int 1/(T - T_A) \cdot dT = \int Kdt$$

Knowing

$$e^{kt+c} = e^{kt} \cdot e^{c}$$

Where

$$e^{c} = A$$

$$e^{kt+c} = Ae^{kt}$$

$$\ln(T - T_A) = Kt + C$$

$$(T - T_A) = e^{kt+c}$$

$$T = T_A + Ae^{kt} \quad \ldots \text{equation 1 (general Solution)}$$

When $t = 0$, $T = 10°c$, $T_A = 25°c$

$$10°c = 25°c + Ae^{0}$$

$$-15 = A$$

When $t = 5min$, $T = 20°$

$$\therefore \quad T = 25 - 15e^{kt}$$

$$20 = 25 - 15e^{5k}$$

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

$$e^{5k} = 0.33$$

$$5K = \ln 0.33 = -1.10$$

$$K = -0.22$$

$$T = 25 - 15e^{-0.22t} \quad \ldots \text{equation 2 (practical Solution)}$$

C(iii)

```
CommandWindow
Clear
clc
Close all
t = [0:1:60]
T = 25-15*exp(-0.22*t)
plot(t,T)
xlabel('t'), ylabel('T'), title('graph of T against t')
```

C(iv) 25°c is the steady state temperature

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

$t \to \infty$

$e^{-0.22(\infty)} = e^{-\infty} = e^{0}$

$T = 25 - 15(1)$

$T = 10°c$