

QUADRI JOHN OBAJUWON

18/ENG04/070

Initial reading  $10^{\circ}\text{C}$

The  $20^{\circ}\text{C}$  5mins after

Actual temp is  $25^{\circ}\text{C}$

to reach  $24.9^{\circ}\text{C}$

$$\frac{dT}{dt} = k(T-25)$$

$$dT = k dt$$

$$T-25$$

$$\ln(T-25) = kt + c$$

$$T-25 = e^{kt+c}$$

$$T-25 = e^{kt} \cdot T_0$$

$$T = T_0 e^{kt} + 25$$

when  $t=0$

$$10 = T_0 e^{k(0)} + 25$$

$$10 = T_0 + 25$$

$$T_0 = -15$$

hence,

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

at 5mins

$$T = 20$$

$$t = 5$$

$$\Rightarrow 20 = -15e^{k(5)} + 25$$

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

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

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

$$5k = \ln 0.33$$

$$5k = -1.0986$$

$$k = -0.2197$$

hence

$$T = -15e^{-0.2197t} + 25$$

when  $T = 24.9^{\circ}\text{C}$

$$24.9^{\circ} = -15e^{-0.2197t} + 25$$

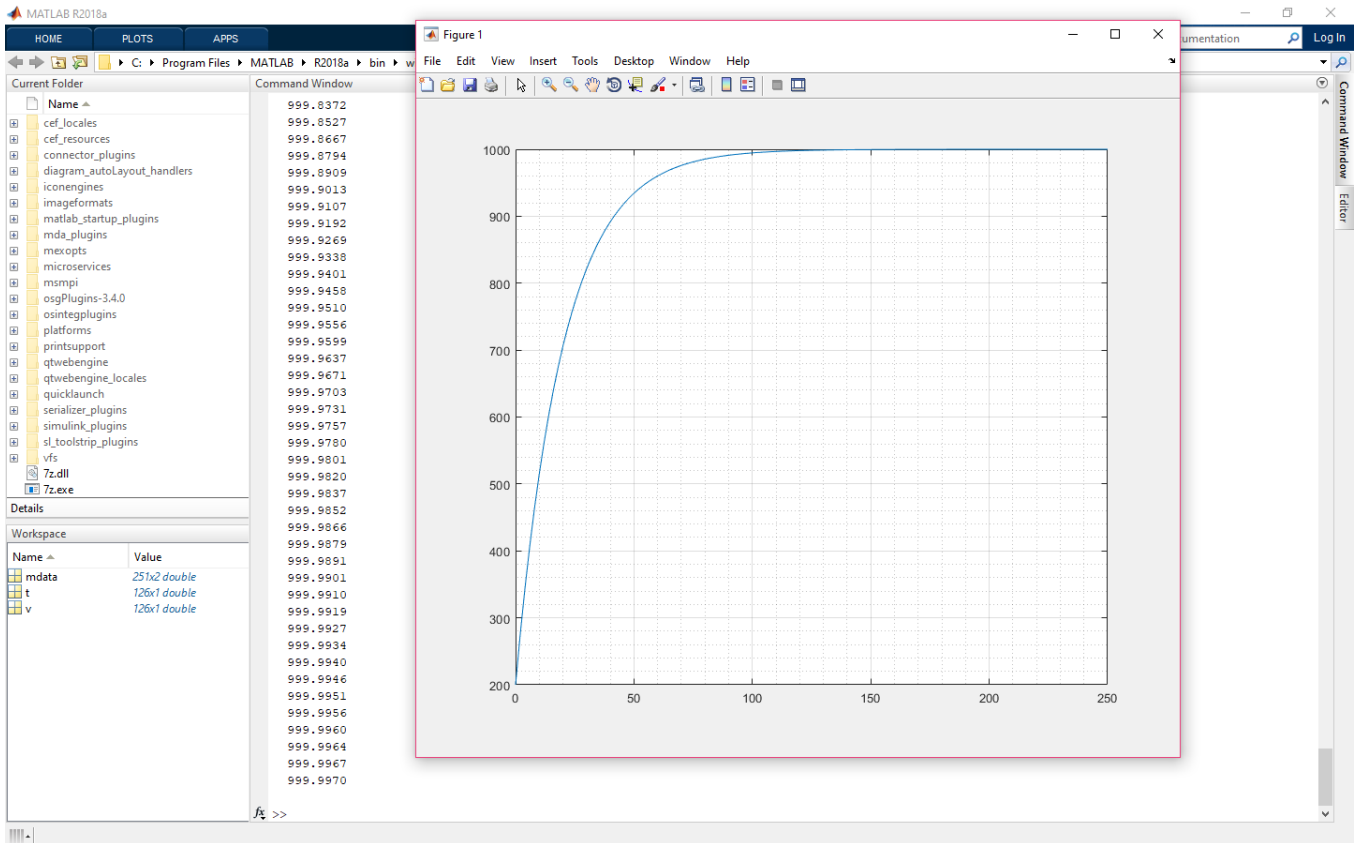
$$15e^{-0.2197t} = 25 - 24.9$$

$$15e^{-0.2197t} = 0.1$$

$$e^{-0.2197t} = 6.67 \times 10^{-3}$$

$$-0.2197t = -5.011$$

$$\therefore t = \underline{\underline{22.81 \text{ mins}}}$$



```
1 - commandwindow
2 - clear
3 - clc
4 - close all
5 - format short
6 - mdata=xlsread('onlinequizdata','fluiddata')
7 - t=mdata(1:2:252,1)
8 - v=mdata(1:2:252,2)
9 - plot(t,v)
10 - grid on
11 - grid minor
12
```

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