



```
- commandwindow  
- clear  
- clc  
- close all  
- format short g  
- mdata=xlread('onlinequizdata','fluiddata')  
- x=mdata(1:2:250,1)  
- y=mdata(1:2:250,2)  
- plot(x,y)  
- grid on  
- grid minor|
```

I

Command Window

```
86  
88  
90  
92  
94  
96  
98  
100  
102
```

In: 11 Col: 1

4 55°C
 5 ... plane (b)

OJO, Oluwadara Toluwani
 18/ENG02/072
 ENQ 284 - Engineering mathematics
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1 $T_1 = 10^\circ\text{C}$
 $T_2 = 20^\circ\text{C}$
 time = 5 mins
 $T_2 - T_1 = 10^\circ\text{C}$ at 5 mins
 So from 20°C to 24.9°C

$$\frac{dT_1}{dt} = -k(T_1 - T_w) + T_c$$

$$\frac{dT_1}{dt} = \frac{-1}{\tau}(T_1 - T_w) + T_c$$

where
 T_c is the initial temperature
 T_w is the water temperature
 T_1 is the thermometer temperature
 τ is the time constant

$$\frac{dT_1}{dt} \propto (T_1 - T_A)$$

$$\frac{dT_1}{dt} = k(T_1 - T_A)$$

Collect like terms
 $\frac{dT_1}{dt} = k(T_1 - 25)$
 Integrate both sides
 $\ln(T_1 - 25) = tK + C$
 $T_1 - 25 = e^{tK + C}$

T_A = Actual temperature
 where $e^C = A$

$$T - 25 = Ae^{tK}$$

$$T = Ae^{tK} - 25$$

at $t = 0, T = 10^\circ\text{C}$
 $10 = Ae^0 - 25$
 $A = 35$
 $T = 35e^{tK} - 25$

at $T = 20^\circ\text{C}, t = 5\text{m}$
 $20 = 35e^{5K} - 25$
 $45 = 35e^{5K}$
 $e^{5K} = 45/35$
 $5K = \ln(45/35)$

$K = 0.05$
 $T = 35e^{0.05t} - 25$
 where $T = 24.9, t = ?$
 $24.9 = 35e^{0.05t} - 25$
 $e^{0.05t} = 49.9/35$
 $0.05t = 0.855$
 $t = 7.1 \text{ minutes}$

2. Command window
 clear
 clc
 close all
 format short g

```
mdata = xlsread('online quiz data', fracture 'fluid data')
```

```
x = mdata(1:2:250, 1)
```

```
y = mdata(1:2:250, 2)
```

```
plot(x, y)
```

```
grid on
```

```
grid minor
```