

Wrench Oxygen fedure

15/05/2010

Biomedical Engineering

Initial 15°C to 20°C after 5 minutes
Actual temperature of system is 25°C

$$\frac{dT}{dt} \propto (T - T_A)$$

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

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

$$\frac{dT}{dt}$$

$$dT = k dt$$

$$T - 25$$

By integration

$$\ln(T - 25) = k t + C$$

$$T - 25 = e^{k t + C}$$

$$\text{Recall } e^{C} = A$$

$$T - 25 = A e^{k t}$$

$$T = A e^{k t} + 25$$

At initial conditions when $t = 0$, $T = 15^{\circ}\text{C}$

$$15 = A e^{0} + 25$$

$$A = -10$$

$$T = -10 e^{k t} + 25$$

At $T = 20^{\circ}\text{C}$ when $t = 5$ mins

$$20 = -10 e^{5k} + 25$$

$$-5 = -10 e^{5k}$$

$$e^{5k} = \frac{5}{10}$$

$$5k = \ln\left(\frac{5}{10}\right)$$

$$k = \frac{\ln(0.5)}{5}$$

$$T = -10 e^{\frac{\ln(0.5)}{5} t} + 25$$

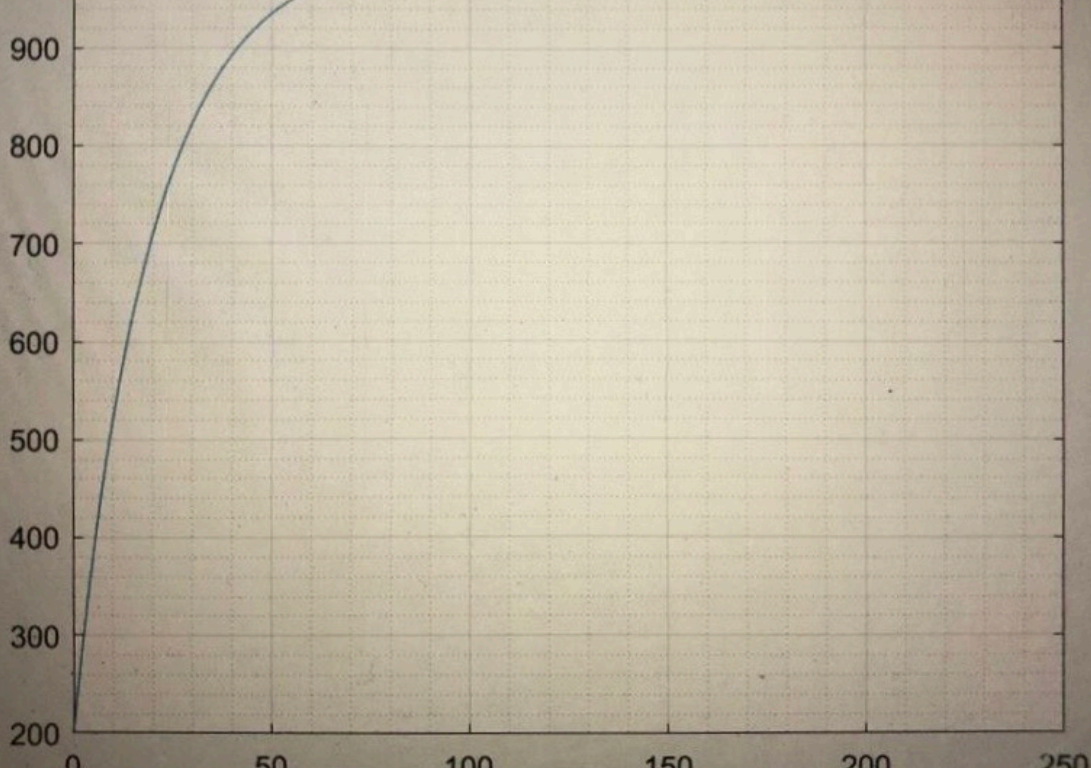
Find t when thermometer is 24.9°C

$$24.9 = -10 e^{\frac{\ln(0.5)}{5} t} + 25$$

$$-0.1 = -10 e^{\frac{\ln(0.5)}{5} t}$$

$$\frac{-0.1}{-10} = e^{\frac{\ln(0.5)}{5} t} = \ln\left(\frac{0.01}{10}\right) = \frac{\ln(0.01)}{5}$$

$$t = 10 \text{ minutes}$$



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

and Window

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