

Question / Eqn
 $T_{inlet} = 10^\circ\text{C}$ $T = 20^\circ\text{C}$ at 5 mins
 $T_{ambient} = 25^\circ\text{C}$
 $\frac{dT}{dt} = k(T - T_a)$
 $\frac{dT}{dt} = k(T - 25)$
 Collecting like terms
 $\frac{dT}{T - 25} = k dt$
 $\ln(T - 25) = kt + C$
 $T - 25 = e^{kt+C}$ where $e^C = A$
 $T - 25 = Ae^{kt}$
 $T = Ae^{kt} + 25$
 at initial conditions $t = 0$ $T = 10^\circ\text{C}$
 $10 = Ae^{0} + 25$
 $A = -15$
 $T = -15e^{kt} + 25$
 $T = 20^\circ\text{C}$ at $t = 5$ mins
 $20 = -15e^{5k} + 25$
 $-5 = -15e^{5k}$
 $\frac{1}{3} = e^{5k}$
 $\ln\left(\frac{1}{3}\right) = 5k \Rightarrow k = \frac{\ln\left(\frac{1}{3}\right)}{5}$
 $k = -0.05$
 $T = -15e^{-0.05t} + 25$
 $T = 24.9$ at $t = ?$

$24.9 = -15e^{-0.05t} + 25$
 $-0.1 = -15e^{-0.05t}$
 $e^{-0.05t} = \frac{0.1}{15} = \frac{1}{150}$
 $\ln\left(\frac{1}{150}\right) = -0.05t$
 $t = \frac{\ln(150)}{0.05} = 7.2$ approx 5

```

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
  
```

