

$T = 10^\circ\text{C}$      $T = 20^\circ\text{C}$      $\theta = 5\text{min}$   
 $\frac{dT}{dt} = h(T - T_a)$   
 $\frac{dT}{dt} = h(T - 25)$   
 $\frac{dT}{T - 25} = h dt$   
 $\ln(T - 25) = h t + C$   
 $T - 25 = e^{h t + C}$  where  $e^C = A$   
 $T - 25 = A e^{h t}$   
 $T = A e^{h t} + 25$   
 At initial condition  $t = 0$      $T = 10^\circ\text{C}$   
 $10 = A e^0 + 25$   
 $A = -15$   
 $T = -15 e^{h t} + 25$   
 at  $T = 20^\circ\text{C}$      $t = 5\text{min}$   
 $20 = -15 e^{h \cdot 5} + 25$   
 $45 = 15 e^{5h}$   
 $e^{5h} = 3$   
 $5h = \ln(3)$   
 $h = \frac{\ln(3)}{5} \Rightarrow h = 0.05$   
 $T = -15 e^{0.05 t} + 25$   
 $\Rightarrow T = 24.996 \text{ at } t = 7$   
 $24.99 = -15 e^{0.05 \cdot 7} + 25$   
 $49.99 = 15 e^{0.35}$   
 $e^{0.35} = 49.99 / 15$   
 $e^{0.35} = \ln(3.3326)$   
 $0.05 t = 0.355$   
 $t = 7.1 \text{ minutes}$

```

clear
clc
close all
format short g
xdata = linspace(0, 100, 100);
ydata = 25 - 15 * exp(-0.05 * xdata);
plot(x, y)
grid on
grid minor

```

