Grafari Oladipo Temi 18/FNG03/028 Civil Engineering

$T_{initial} = 10°C$

$T = 20°C$

at 5 mins

$T_{after} = 25°C$

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

T_A = Actual temperature

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

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

Collecting like terms

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

By integrating both sides

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

$T - 25 = e^{tk+c}$ where $e^c = A$

$T - 25 = e^{tk} \times e^c$

$T - 25 = Ae^{tk}$

$T = Ae^{tk} - 25$

at initial conditions $t = 0$, $T = 10°C$

$10 = Ae^0 - 25$

$A = 35$

$T = 35e^{tk} - 25$

$t = 5$ minutes

$T = 20°C$

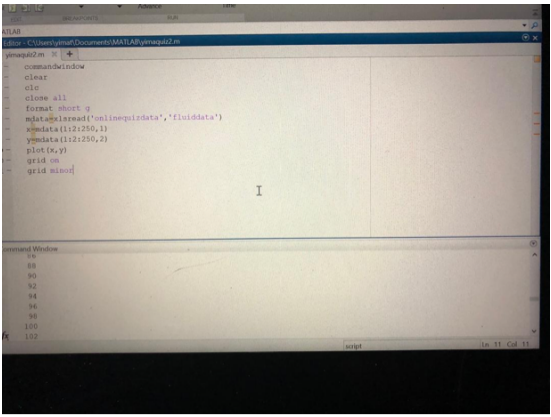
$20°C = 35e^{5k} - 25$

$45 = 35e^{5k}$

$e^{5k} = 45/35$

$5k \ln(e) = \ln(45/35)$

$k = \frac{0.251}{5}$

$k = 0.05$

$T = 35e^{0.05t} - 25$