Temperature of cup of coffee is given by the following formula (Newton's Law of Cooling): $T = C + (T_0 - C)e^{-kt}$ , where C is the room temperature and $T_0$ is the initial temperature of the cup of coffee. Time t is measured in minutes. The temperature of the coffee when it was served was 1850F. Two minutes later, the temperature of the coffee dropped to 1550F. When will the temperature of the coffee drop to 1050F, if the room temperature is 650F

Solution:

$C = 650F$

$T_0 = 1850F$

When $t = 2$, then $T = 1550F$ , so

$1550 = 650 + (1850 - 650)e^{-2k}$

$e^{-2k} = \frac{900}{1200} = 0.75$

$-2k = \ln 0.75 = -0.2877$

$k = 0.1438$

Hence when $T = 1050F$, then

$1050 = 650 + (1850 - 650)e^{-0.2877t}$

$e^{-0.2877t} = \frac{400}{1200} = \frac{1}{3}$

$-0.2877t = \ln\frac{1}{3} = -1.0986$

Answer:

$t = 3.8$ minutes