Problema 27 Enfriamiento pavo.

$t_0 = 0 \rightarrow T_0 = 185°F$

$T_A = 75°F$

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

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

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

$$\ln|T - T_A| = kt + C$$

$$T - T_A = e^{kt+C} \rightarrow T - T_A = Ce^{kt}$$

$$T = Ce^{kt} + T_A$$

$$T = Ce^{kt} + 75 \rightarrow 185 = Ce^{0} + 75$$

$$185 - 75 = C$$

$$110 = C \rightarrow T = 110e^{kt} + 75$$

$$150 = 110e^{k(30)} + 75$$

$$\frac{75}{110} = e^{k(30)} \rightarrow \frac{15}{22} = e^{k(30)}$$

$$\ln(15/22) = k30$$

$$\frac{\ln(15/22)}{30} = k$$

a) $T = 110\, e^{kt} + 75$

$T(45)$ $\left[\ln(15/22)/30\right] \cdot 45$

$T = 110\, e$ $+ 75$

$T = 136.93\,^{\circ}F$

Después de 45 minutos su temperatura es de $136.93\,^{\circ}F$

Oy

b)

$100 = 110\, e^{k \cdot t} + 75$

$\frac{100 - 75}{110} = e^{k \cdot t} \rightarrow \frac{5}{22} = e^{k \cdot t}$

$\ln\left(\frac{5}{22}\right) = k \cdot t$

$\frac{\ln\left(\frac{5}{22}\right)}{\frac{\ln(15/22)}{30}} = t$

$116.05 \text{ minutos} = t$

El tiempo que le toma llegar al pavo a 100 °F es de 116.05 minutos.

Ebullición del agua

$T_A = 20°C$ $T_0 = 100°C$

$T(15) = 75°C$

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

$$\ln T - T_k = kt + C$$

$$T - T_A = Ce^{kt}$$

$$T = Ce^{kt} + T_A$$

$$T = Ce^{kt} + 20$$

$$80 = Ce^{k0}$$

$$T = 80e^{kt} + 20$$

$$75 = 80e^{k15} + 20$$

$$\frac{11}{16} = e^{k15} \rightarrow \ln\left(\frac{11}{16}\right) = k15 \ln e$$

$$\frac{\ln(11/16)}{15} = k$$

$$T(t) = 80\, e^{-\frac{\ln(11/16)}{15} t} + 20$$

$$T(t) = 80\, e^{\frac{\ln(11/16)}{15}(25)} + 20$$

$$T(t) = 62.84\ ^\circ C$$

Después de otros 10 minutos la temperatura es de $62.84^\circ C$