$$T(t) = S - (S - T_0)e^{-kt}$$

$$80 = 65 - (65 - 80)e^{-k \cdot 0} \quad (t = 0)$$

$T(0)$

$$70 = 65 - (65 - 80)e^{-k \cdot 2} \quad (t = 2)$$

$T(2)$

$$70 - 65 = 15\, e^{-k \cdot 2}$$

$$\frac{1}{3} = e^{-2k} \longrightarrow \ln\left(\frac{1}{3}\right) = -2k$$

$$k = -\frac{1}{2}\ln\left(\frac{1}{3}\right)$$

$$T(t) = 65 + 15 \cdot e^{\frac{1}{2}\ln\left(\frac{1}{3}\right)t}$$

Find t when $T(t) = 98.6$

$$98.6 = 65 + 15 \cdot e^{\frac{1}{2}\ln\left(\frac{1}{3}\right)t}$$

$$\frac{33.6}{15} = e^{\frac{1}{2}\ln\left(\frac{1}{3}\right)t}$$

T.O.D.: (12 am − 1.47 hours)

$$\ln\left(\frac{33.6}{15}\right) = \boxed{\frac{1}{2}\ln\left(\frac{1}{3}\right)}t$$

$$t = \frac{\ln\left(\frac{33.6}{15}\right)}{\frac{1}{2}\ln\left(\frac{1}{3}\right)} = -1.47 \text{ hours.}$$