Fitting Einstein’s Heat Capacity Equation to Experimental Data for Silver

The heat capacity data were taken from the *Handbook of Physics and Chemistry - 72nd Edition*, page 5-71. The data are presented in units of Joules/mole/K.

Gas law constant: \( R = 8.3145 \)

Define Einstein function for heat capacity:

\[
F(T, \Theta) := 3 \cdot R \cdot \left( \frac{\Theta}{T} \right)^2 \frac{\exp \left( \frac{\Theta}{T} \right)}{\left( \exp \left( \frac{\Theta}{T} \right) - 1 \right)^2}
\]

where \( \Theta = \frac{h \cdot v}{k} \)

Form the sum of the squares of the deviations:

\[
SSD(\Theta) := \sum_i \left( C_i - F(T_i, \Theta) \right)^2
\]

Minimize the sum of the squares of the deviations:

\[
\Theta := 200 \quad \text{Given} \quad SSD(\Theta) = 0 \quad \Theta := \text{Minerr}(\Theta)
\]

Einstein Temperature for best fit: \( \Theta = 154.707 \)

Mean squared error:

\[
\frac{SSD(\Theta)}{(n - 2)} = 0.319
\]

Plot data and fit:

\[
t := 1 \ldots 300
\]