Problem Statement: With the given data equation, I want to find which material is able to remain hot for the longest time in the absence of a heat source

Diagram: see file HW_14p1_Task2_PPM_gamageld.xlsx

Assumptions:

- Device that measured temp. of material is accurate.
- Best fit line on Excel is accurate.
- Material don't have any impurities

Solution:

Tmat 3: Coordinates (24,98) & (60,10)

$$m = \frac{\ln|10| - \ln|98|}{60-24} = -.06340$$

$$\ln|b| = \ln|10| - |-.06340|(60)$$

$$b = 448.803$$

$$y = 448.803e^{-.06340x}$$

Solution Continued:

Tmat 2: Coordinates (15,90) & (50,5.0)

$$m = \frac{\ln|5.0| - \ln|90|}{50-15} = -.08258$$

$$\ln|b| = \ln|5| - (-.08258)(50)$$

$$b = 310.579$$

$$y = 310.579e^{-.08258x}$$

Tmat 1: coordinates (14,71) & (40,4.2)

$$m = \frac{\ln|4.2| - \ln|71|}{40-14} = -.10875$$

$$\ln|b| = \ln|4.2| - (-.10875)(40)$$

$$b = 325.41$$

$$y = 325.4e^{-.10875x}$$

Verification: Look at excel file

Conclusion:

From the equations I found & data I graphed, I can determine that material 3 is the best for keeping an object hot as long as possible without a heat source. This is because on the graph, material 3 has the least change in temp as compared to the other material. Also, for the equations I found, material 3 has the lowest magnitude for the slope indicating a slower rate of change.