

Math SL EXPLORATION LAB 8

In this assignment, you will analyze a data set that has been obtained from monitoring the temperature of a cooling cup of coffee. The temperature of Mr. Santowski's coffee has been measured as a function of the time since the coffee was made on a day when the room temperature was 26.8°C .

Time (min)	0	5	10	15	20	25	30	35	40	45	50
Temp ($^{\circ}\text{C}$)	82.5	73	65.5	61.7	57.7	54	51.1	49	47	45	43.1
Time (min)	60	71	80	89	100	110	120	150	180	210	240
Temp ($^{\circ}\text{C}$)	40.1	37.1	35.2	34.2	32.7	31.4	30.8	29	28	27.2	27

In this assignment, you are required to:

- (1) Prepare a scatterplot graph of the data using technology.
- (2) Provide a mathematical analysis of the data in order to generate an exponential equation that models the data set and fits the context of the data. Show/explain the analysis that leads to your conclusion. How can you confirm/verify that your equation is "correct"?
- (3) Rewrite your equation using the natural base e . Show the algebraic analysis that leads to your answer.
- (4) Graph the equation you just developed and show the function as well as the data set. Explain how well the equation does/doesn't fit the data. Offer explanations as to why/why not.
- (5) Use your model to predict the temperature of the coffee at a time of 30 minutes. 60 minutes. 180 minutes.
- (6) At what time will the temperature of the coffee be 50°C ? 26°C ? Show an algebraic solution.

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(7) How well does the function fit the data?

(8) At what rate ($^{\circ}\text{C}$ per minute) is the coffee cooling? Show/explain the analysis that leads to your conclusion.

(9) BONUS OPTION 1: Analysis Method #2 - Semi-log Graphing \Rightarrow Graph the data on semi-log paper. Determine the equation of the line of best fit. Rearrange this equation to an exponential equation in base 10 and then base e . Show work. You can get two or three cycle semi-log paper [by following this link](#):

(http://www.csun.edu/~vceed002/ref/measurement/data/graphpaper/semi_log_numbered.pdf)

(10) BONUS OPTION 2: How can we use calculus to do an analysis of this data set and develop an equation?