Applications of Transformations

Given the data set, you will fit a function on the data. You will be given a parent/base function which you must fit onto the data using only your knowledge of transformations. You must CLEARLY COMMUNICATE to me HOW and WHY you applied the various transformations onto the data.

Data Set #1 for a QUADRATIC MODEL ($y = x^2$)

Data table shows the amount of corn harvested (yield), y, for various amounts of fertilizer used, x.

Fertilizer amt (kg/hectare)	Yield (bushels)
0	4
0	6
5	10
5	7
10	12
10	10
15	15
15	17
20	18
20	21
25	20
25	21
30	21
30	22
35	21
35	20
40	19
40	19

Data set #2 for an EXPONENTIAL MODEL ($y = 2^x$)

A cup of coffee was left to cool in a room where the temperature was 26.8°C

Time (min)	Temp (°C)
0	82.5
5	73
10	65.5
15	61.7
20	57.7
25	54
30	51.1
35	49
40	47
45	45
50	43.1
60	40.1
65	39.8
71	37.1
75	36.5
80	35.2
88	34.2
95	33.2
105	32
117.5	31
128	30.2
151	29
167	28.4
191	27.9
217	27.2
240	27

Data Set #3 for a SINUSOIDAL MODEL ($y = \sin x$)

This table gives the fraction of the moon that is visible at midnight as the new year began

Day of the year	Fraction of Moon Visible
1	0.25
2	0.18
3	0.11
4	0.06
5	0.02
6	0.00
10	0.11
15	0.57
20	0.99
21	1.00
25	0.80
30	0.32
35	0.02
40	0.14
45	0.64
50	1.00
55	0.77
60	0.31
65	0.01
66	0.00

HINT: WORK IN RADIAN MODE

What you must hand in:

(a) Scatter plot of data (GDC generated)
(b) Final transformed base function superimposed upon the data
(c) Explanation as to what you did and why in order to transform the function to fit the data
(d) How confident are you that your function fits the data. EXPLAIN the reasons for your confidence/non confidence

Scoring Rubric

	Emerging	Developing	Proficient	Exemplary
Conceptual Understanding **Key Question**: *Does your interpretation of the problem using mathematical representations and procedures accurately reflect the important mathematics in the problem?*	1. Your mathematical representations of the problem were incorrect. 2. You used the wrong information in trying to solve the problem. 3. The mathematical procedures you used would not lead to a correct solution. 4. You used mathematical terminology incorrectly.	1. Your choice of forms to represent the problem was inefficient or inaccurate. 2. You used some but not all of the relevant information from the problem. 3. The mathematical procedures you used would lead to a partially correct solution. 4. You used mathematical terminology imprecisely.	1. Your choices of mathematical representations of the problem were appropriate. 2. You used all relevant information from the problem in your solution. 3. The mathematical procedures you chose would lead to a correct solution. 4. You used mathematical terminology correctly.	1. Your choice of mathematical representations helped clarify the problem's meaning. 2. You uncovered hidden or implied information not readily apparent. 3. You chose mathematical procedures that would lead to an elegant solution. 4. You used mathematical terminology precisely.
Strategies and Reasoning **Key Question***:* *Is there evidence that you proceeded from a plan, applied appropriate strategies, and followed a logical and verifiable process toward a solution?*	1. Your strategies were not appropriate for the problem. 2. You didn't seem to know where to begin. 3. Your reasoning did not support your work. 4. There was no apparent relationship between your representations and the task 5. There was no apparent logic to your solution. 6. Your approach to the problem would not lead to a correct solution.	1. You used an oversimplified approach to the problem. 2. You offered little or no explanation of your strategies. 3. Some of your representations accurately depicted aspects of the problem. 4. You sometimes made leaps in your logic that were hard to follow. 5. Your process led to a partially complete solution.	1. You chose appropriate, efficient strategies for solving the problem. 2. You justified each step of your work. 3. Your representation(s) fit the task. 4. The logic of your solution was apparent. 5. Your process would lead to a complete, correct solution of the problem.	1. You chose innovative and insightful strategies for solving the problem. 2. You proved that your solution was correct and that your approach was valid. 3. You provided examples and/or counterexamples to support your solution. 4. You used a sophisticated approach to solve the problem.
Communication **Key Question:** *Was I able to easily understand your thinking or did I have to make inferences and guesses about what you were trying to do?*	1. I couldn't follow your thinking. 2. Your explanation seemed to ramble. 3. You gave no explanation for your work. 4. You did not seem to have a sense of what your audience needed to know. 5. Your mathematical representations did not help clarify your thinking.	1. Your solution was hard to follow in places. 2. I had to make inferences about what you meant in places. 3. You weren't able to sustain your good beginning. 4. Your explanation was redundant in places. 5. Your mathematical representations were somewhat helpful in clarifying your thinking.	1. I understood what you did and why you did it. 2. Your solution was well organized and easy to follow. 3. Your solution flowed logically from one step to the next. 4. You used an effective format for communicating. 5. Your mathematical representations helped clarify your solution.	1. Your explanation was clear and concise. 2. You communicated concepts with precision. 3. Your mathematical representations expanded on your solution. 4. You gave an in-depth explanation of your reasoning.

Class Example:

Length of a pendulum (in cm)	Time taken for 30 oscillations (seconds)
107	62.3, 63.1, 64.0
85	56.4, 57.9, 57.0
72	51.9, 49.9, 51.8
63	48.2, 47.3, 48.1
52	43.9, 44.5, 43.6
45	41.3, 40.2, 42.0
36	36.8, 36.8, 36.9

A weight is put onto an elastic band and the elastic band is stretched. The system is allowed to come to rest, after which the weight is pulled down and then released

Time (seconds)	Displacement top of elastic (cm)
0	31
1	20
2	26
3	39
4	34
5	21
6	24
7	38
8	36
9	22
10	22
11	36