6.6B – Regression Models Problem

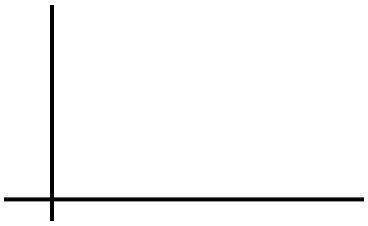
Your biology class is studying the lifecycle of Glycine max (the plant more commonly known as Soybean), and specifically you will be investigating the effects of limiting the amount of food (fertilizer) used for the plants' growth.

Group A will not give their plants any fertilizer for the first week after planting after which they will feed and water the plants normally for the remainder of the study.
Group B will feed and water their plants normally for the first week, then not give any fertilizer for the 2nd week, and then return to the regular amounts of fertilizer and water for the 3rd week of the study.
Group C will feed and water their plants normally for the first week, and then gradually decrease the amount of fertilizer until the end of the study.

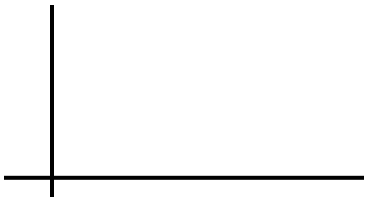
<u>Part One</u>

Make predictions about the relationship between Day Number (from beginning of study) and plant height (cm) for each of the groups. Sketch your predictions below.

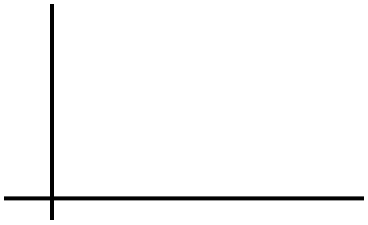
Group A

Sketch	Rationale
	

Group B

Sketch	Rationale
	

Group C

Sketch	Rationale
	

Part Two

The heights of the plants were measured throughout the study and the following data was taken by each group:

Group A	
Day	Height (cm)
1	4.4
3	5.8
4	6.7
7	10.4
8	12.0
10	15.9
13	24.5
15	32.6
16	37.6
19	57.9
21	77.1

Group B	
Day	Height (cm)
1	3.7
2	9.5
5	24.0
6	26.4
8	28.5
11	30.1
14	33.1
16	37.7
18	45.6
20	58.2
21	66.4

Group C	
Day	Height (cm)
1	3.5
3	19.0
5	23.9
6	25.8
9	31.0
11	33.9
12	35.2
15	39.0
17	41.3
20	44.6
21	45.7

Analysing the Data for Group B

1. Use your graphing calculator to construct a scatter plot for the Group B data. Sketch the scatter plot you obtained below. Remember to label your axes.

2. Perform an analysis of the data and, selecting from the functions you have studied, identify the type of function that you think best models it.

   _____

3. Use your knowledge of function properties to determine a function model that best fits the data.

   My function model is: _____

Analysing the Data for Group C

4. The data for Group C was entered into the graphing calculator and a regression analysis was performed. The function that best models this data is, $y = 17\sqrt{0.3x + 3}$. Graph this function on the grid below. Be sure to include all labels.

5. State the domain and range of the model. Use interval notation.

Domain: $x \in$_____ Range: $y \in$ _____

6. Describe, in words, the transformations needed to obtain $y = 17\sqrt{0.3x + 3}$ from the graph of $y = \sqrt{x}$.

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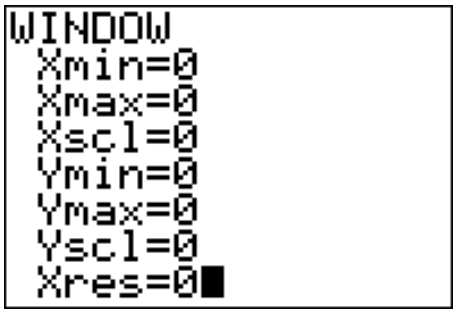
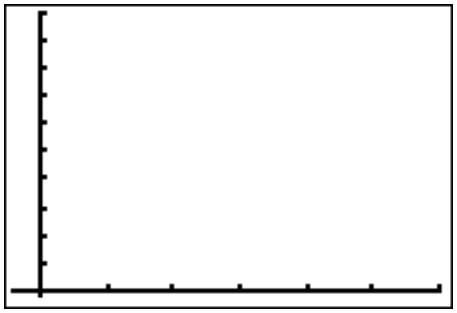
7. Describe what the transformations could mean in the context of this experiment.

Analysing the Data for Group A

8. Enter the data for Group A into the graphing calculator and construct a scatter plot for the data. Complete both of the screen shots below using the information from your calculator.





9. The type of function that I feel best describes this data is?

10. Use your knowledge of function properties to determine a function model that best fits the data.

    My function model is: _____

11. State the following for the model you found above.

    a) Domain (interval notation) _____

    b) Range (set notation) _____

    c) Maximum (if any) _____

    d) Minimum (if any) _____

    e) Equation of Asymptotes (if any) _____

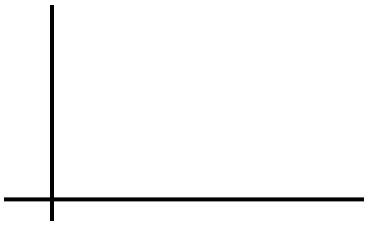
12. Describe the restrictions to the domain and range (if any), of the function model you have found, that would apply to the real-life application of Soybean plant growth.

Making Predictions from Your Results

13. If each group were to continue to feed and water their plants normally for another three weeks, discuss what changes or modifications (if any) you would need to make on each of the three function models.

14. Another group in your class, Group D, acted as the Control Group. They fed and watered their plants as normal during the whole experiment.

    a) What type of function (or combination of functions) do you feel would best model the data that this group would have collected?

Sketch	Type or Combination of Functions and Rationale
	

    b) Discuss what changes or modifications (if any) you would need to make on this function model, if Group D was to continue the experiment for another three weeks.