Exploring Residuals and Regression Models **Name: _____**

Part 1: Analyzing a Least Squares Regression

Consider the data set below, which shows the number of hours studied (x) and the score on a test (y):

Hours Studied (x)	Test Score (y)
1	55
2	58
3	64
4	65
5	72
6	75

The least squares regression line is given by the equation (round to three decimal points):

$\hat{y} =$

Where $\hat{y}$ represents the predicted test score for a given number of hours studied.

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1. Calculate the Predicted Scores

Using the least squares regression equation, calculate the predicted score ($\hat{y}$) for each number of hours studied. Fill in the table below:

Hours Studied (x)	Test Score (y)	Predicted Score ($\hat{y}$)	Residual ($y - \hat{y}$)
1	55		
2	58		
3	64		
4	65		
5	72		
6	75		

2. Calculate Residuals

Using the formula for residuals:

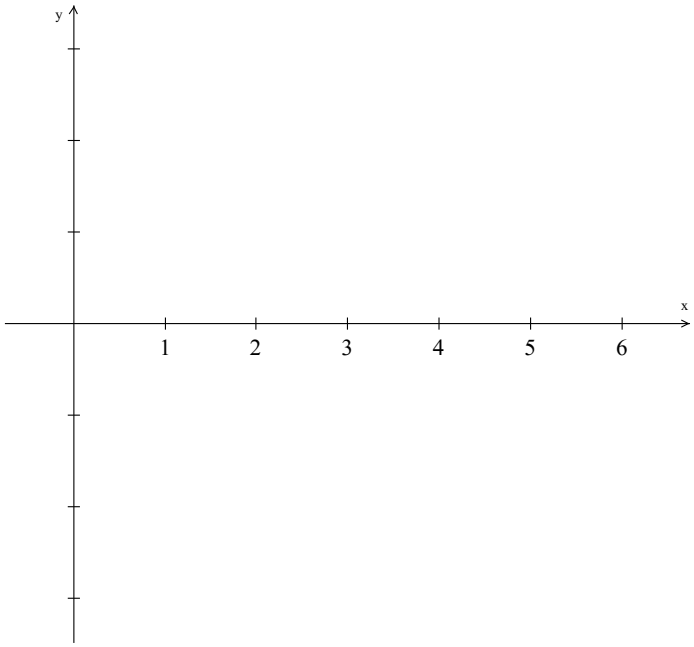
Residual = Observed Value(y) – Predicted Value ($\hat{y}$)

Complete the residuals column in the table above.

Part 2: Residual Plot

3. Create a Residual Plot

On the graph provided below, plot the residuals you calculated in Part 1 for each number of hours studied. Label the *x*-axis as "Hours Studied" and the *y*-axis as "Residuals." Make sure to accurately plot each residual.



4. Interpreting the Residual Plot

Answer the following questions based on your residual plot:

- Does the residual plot show any clear patterns (e.g., curvature, clusters, etc.)?

- Based on the residual plot, do you think a linear model is appropriate for this data? Why or why not?

Part 3: Alternative Model Investigation

5. Exploring Nonlinear Models

If the residual plot suggests a nonlinear relationship, propose an alternative model (e.g., quadratic, exponential) that might better fit the data and explain your reasoning.

Part 4: Reflection

6. Reflection Questions

- What do residuals tell us about the fit of a regression model?

- Why is it important to look at residual plots when evaluating the fit of a linear model?