



In this activity, you will investigate a residual plot for a set of data after selecting a regression model. The residual plot is used to justify the choice of a function model based on an analysis of the residuals.

L1	L2	L3	L4	L5	L6
-1	-7	0	2	5	7
0	-4	2	5	7	10
2	-1	5	6	8	16
5	6	7	8	10	16
7	8	10	16		

### Part 1

Use the following data set in Part 1.

$x$	-1	0	2	5	7	10
$y$	-7	-4	-1	6	8	16

- To enter the data, select **[stat]** 1: Edit... Enter the x values in [L1] and the y values in [L2].

To run a linear regression, select **[stat]** and use the right arrow to highlight CALC.

Select 4: LinReg (ax + b). Make sure the Xlist: is set to L1 and the Ylist: is set to L2. Arrow down to Store RegEQ: and press **[alpha]****[trace]** to select 1: Y1. Arrow down to Calculate and press **[ENTER]**. The linear regression is calculated and is also stored in Y1.

What is your linear regression equation?

- To view the scatter plot, press **[2nd]****[Y=]** to access STAT PLOTS. Select 1: Plot 1 and press **[ENTER]**. Use the arrow keys to change the settings to match the screen to the right. Select **[ZOOM]** 9: ZoomStat. **Note:** To hide the graph of the linear regression equation, select **[Y=]**, use the left arrow key to place it on the = sign and press enter. Select **[graph]** to view the scatter plot.

Plot1	Plot2	Plot3
On	Off	Off
Type: Off		
Xlist: L1		
Ylist: L2		
Mark: +		
Color: BLUE		

The residual is the actual value minus the predicted value. A regression model is justified as appropriate for a data set if the residuals of a regression, the residual plot, appear without pattern. To view the residual plot, press **[2nd]****[Y=]** and edit the settings of Plot 1 to match the screen to the right. Note: Resid is found by pressing **[2nd]****[stat]**. Select **[ZOOM]** 9: ZoomStat.

Plot1	Plot2	Plot3
On	Off	Off
Type: Off		
Xlist: L1		
Ylist: RESID		
Mark: +		
Color: BLUE		

Does your residual plot have a pattern? Would a linear regression be appropriate for this data set?



3. To evaluate the predicted values, press  $\alpha$   $\text{trace}$  to select 1: Y1. Calculate  $Y1(-1)$  and then calculate the residual when  $x$  is  $-1$ . Calculate  $Y1(0)$  and then calculate the residual when  $x$  is  $0$ . Notice that one residual value is negative and one is positive. What does this tell us about the predicted value as being an underestimate or an overestimate?

**Note:** To view the residual list for all of the data points, select  $\text{stat}$  1: Edit... . Arrow to the right until you get to L6. Press the Up arrow and then the right arrow. Open the List Editor by selecting  $2\text{nd}$   $\text{stat}$ . Select 7: RESID and press  $\text{ENTER}$ .

**Part 2**

Use the following data set in Part 2.

$x$	-1	0	1	2	4	5
$y$	0.2	0.6	0.9	2.1	7.9	16.2

4. Follow the steps in Part 1. Enter the data in L1 and L2. Compute a linear regression, view the scatter plot, and view the residual plot. Does your residual plot have a pattern? Would a linear regression be appropriate for this data set?
5. Now compute an exponential regression which is 0: ExpReg in the Stats Calc menu. View the scatter plot, and the residual plot. Does your residual plot have a pattern? Would an exponential regression be appropriate for this data set?