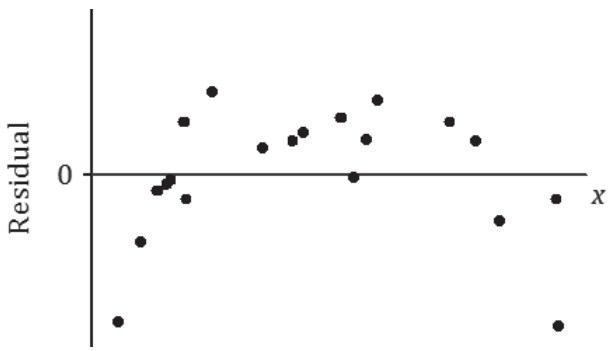
NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

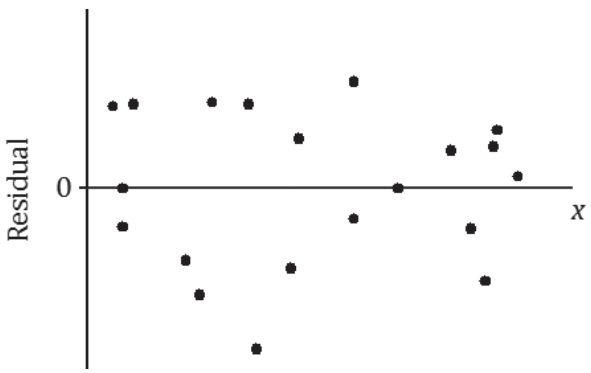
1. For each of the following residual plots, what conclusion could you reach about the relationship between the variables in the original data set? Indicate whether the values would be better represented by a linear or a nonlinear relationship.

A.



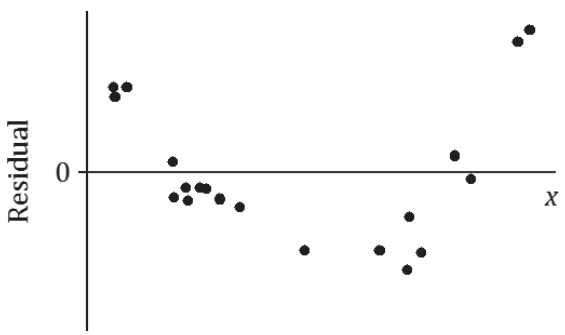
Non-linear

B.



Linear

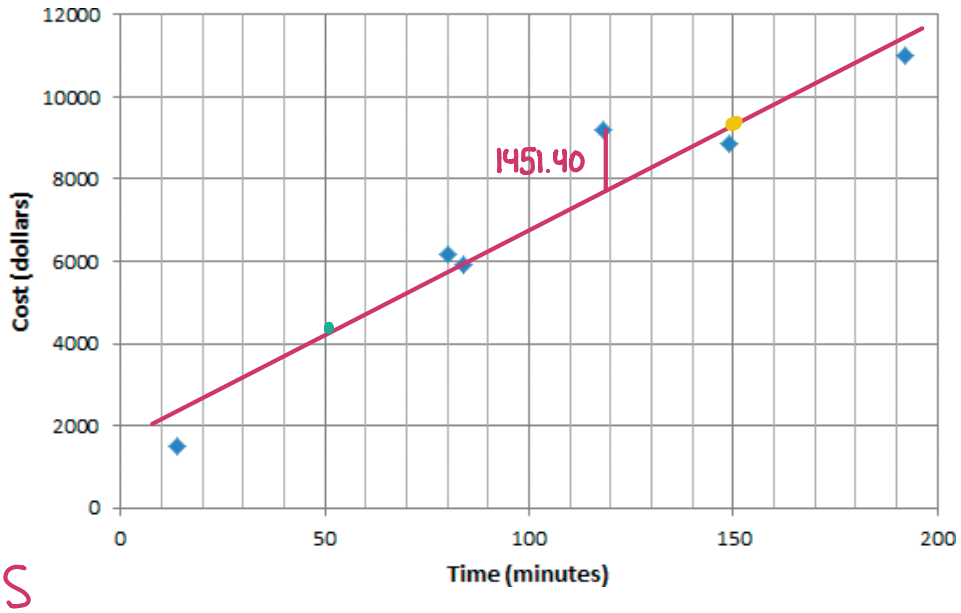
C.



Non-Linear

The time spent in surgery and the cost of surgery was recorded for six patients. The results and scatter plot are shown below.

Time (minutes)	Cost ($)
14	1,510
80	6,178
84	5,912
118	9,184
149	8,855
192	11,023



* USE DESMOS

2. Calculate the equation of the least squares line relating cost to time. (Indicate slope to the nearest tenth and *y*-intercept to the nearest whole number.)

$y = 52.7 + 1514$ $x \rightarrow$ time (minutes)
$y \rightarrow$ cost (dollars)

3. Draw the least squares line on the graph above. (Hint: Substitute $x = 50$ into your equation to find the predicted *y*-value. Plot the point (50, your answer) on the graph. Then substitute $x = 150$ into the equation, and plot the point. Join the two points with a straightedge.)

$y = 52.7(50) + 1514$
$y = \$4149$

$y = 52.7(150) + 1514$
$y = \$9,419$

4. What does the least squares line predict for the cost of a surgery that lasts 118 min? (Calculate the cost to the nearest cent.)

$y = 52.7(118) + 1514$
$= \$7732.60$

5. How much do you have to add to your answer to Problem 4 to get the actual cost of surgery for a surgery lasting 118 min.? (This is the residual.)

118 → 9184.00
− 7732.60
$1451.40 more.

6. Show your answer to Problem 5 as a vertical line between the point for that person in the scatter plot and the least squares line.

* SEE GRAPH

7. Remember that the residual is the actual *y*-value minus the predicted *y*-value. Calculate the residual for the surgery that took 149 min. and cost $8,855.

$y = 52.7(149) + 1514$
$= 9366.3$

$8855 - 9366.3 =$
$-\$511.30$

8. Calculate the other residuals, and write all the residuals in the table below. Then graph the residual data on the scatterplot on the previous page.

Time (minutes)	Cost ($)	Predicted Value ($)	Residual ($)
14	1,510	2251.8	−741.8
80	6,178	5730	448
84	5,912	5940.8	−28.8
118	9,184	7732.6	1451.4
149	8,855	9366.3	−511.3
192	11,023	11632.4	−609.4

9. Suppose that a surgery took 100 min.

   A. What does the least squares line predict for the cost of this surgery?

$y \approx 52.7(100) + 1514 = \$6784$

   B. Would you be surprised if the actual cost of this surgery were $9,000? Why, or why not?

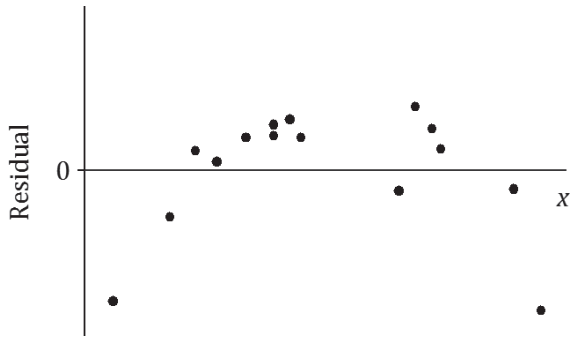
yes, because $9000 - 6784 = 2216$ (highest residual)

   C. Interpret the slope of the least squares line.

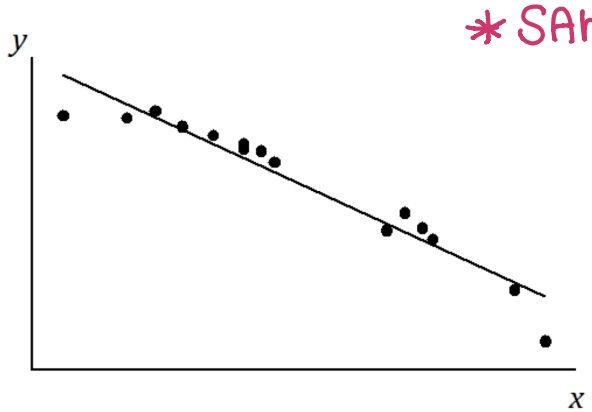
$\frac{\$52.7}{1\ (min)}$

Each additional minute in surgery, increases the cost by $52.70.

10. Suppose that after fitting a line, a data set produces the residual plot shown below.



An incomplete scatter plot of the original data set is shown below. The least squares line is shown, but the points in the scatter plot have been erased. Estimate the locations of the original points, and create an approximation of the scatter plot below.



* SAMPLE ANSWER.