

HW 2 – Choosing a Model and Residual Values

Name \_\_\_\_\_

1. Suppose Ralph's exam grade can be determined by an equation, where  $x$  is the number of hours he studied and  $y$  is the grade. The table of information is given below.

Hours	0	2	4	6	8	10
Grade	42	74	90	90	74	42

a. According to the table, find the LSRL and  $r^2$  that models the grade "y" after the number of hours "x" studied.

LINEAR:  $y = 0x + 69$   $r^2 = 0$       QUADRATIC:  $y = -2x^2 + 20x + 42$   $r^2 = 1$       EXPONENTIAL:  $y = 65.4(1)^x$   $r^2 = 0$

b. Which equation is best fit? Quadratic

c. According to the table above, what is the highest grade that Ralph can earn on his exam? 90

d. Enter your equation from part (a) in your calculator and find the **vertex**. What does the **vertex** represent in this problem? (you may want to change the Y max in your WINDOW)  
vertex  $\rightarrow (5, 92)$  the highest grade is a 92 if you study for 5 hours

What would be the expected grade earned if Ralph studied for 3 hours? 84

$y = -2(3)^2 + 20(3) + 42$

2. Which kind of function best models the data in each table? Write the equation and  $r^2$  for each and circle which is the best.

8.

x	y
0	-5
1	-3
2	-1
3	1
4	3

9.

x	y
0	0
1	2.8
2	11.2
3	25.2
4	44.8

LINEAR:  $y = 2x - 5$   $r^2 = 1$   
 QUADRATIC:  $y = 0x^2 + 2x - 5$   $r^2 = 1$   
 EXPONENTIAL: ~~\_\_\_\_\_  $r^2 =$  \_\_\_\_\_~~

LINEAR:  $y = 11.2x - 5.6$   $r^2 = .9195$   
 QUADRATIC:  $y = 2.8x^2$   $r^2 = 1$   
 EXPONENTIAL: ~~\_\_\_\_\_  $r^2 =$  \_\_\_\_\_~~

+ this is really linear!

11.

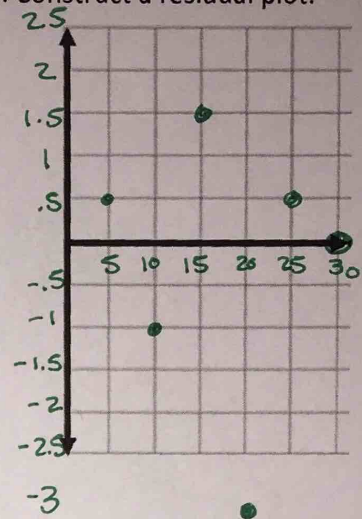
x	y
0	5
1	2
2	0.8
3	0.32
4	0.128

LINEAR:  $y = -1.1x + 3.9$   $r^2 = .8080$   
 QUADRATIC:  $y = .5x^2 - 3x + 4.8$   $r^2 = .9855$   
 EXPONENTIAL:  $y = 5(.4)^x$   $r^2 = 1$

Complete each table using the given LSRL (Round answers to one decimal place). Construct a residual plot.

3. LSRL:  $\hat{y} = .5x + 0$  (ROUND TO 1 DECIMAL)

x	y	Predicted Value ( $\hat{y}$ )	Residual Value ( $y - \hat{y}$ )
5	3	2.5	.5
10	4	5	-1
15	9	7.5	1.5
20	7	10	-3
25	13	12.5	.5
30	15	15	0

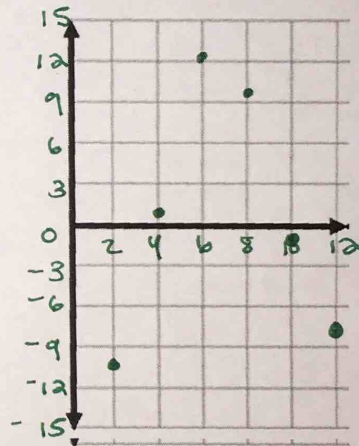


Does the residual plot suggest a linear relationship? Explain.

yes  $\rightarrow$  it is randomly scattered on both sides

4. LSRL:  $\hat{y} = -.4x + 16.3$  (ROUND TO 1 DECIMAL)

x	y	Predicted Value ( $\hat{y}$ )	Residual Value ( $y - \hat{y}$ )
2	5	15.5	-10.5
4	15	14.7	.3
6	26	13.9	12.1
8	23	13.1	9.9
10	11	12.3	-1.3
12	3	11.5	-8.5

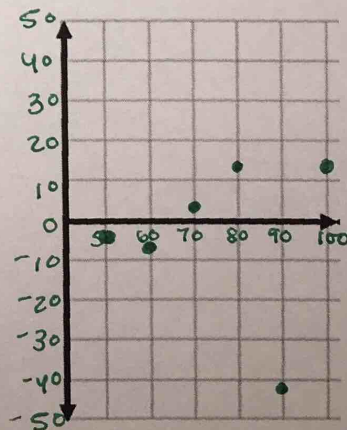


Does the residual plot suggest a linear relationship? Explain.

no  $\rightarrow$  this one looks more curved so a non-linear model would be best

3. LSRL:  $\hat{y} = 4.5x + 42.1$  (ROUND TO 1 DECIMAL)

x	y	Predicted Value ( $\hat{y}$ )	Residual Value ( $y - \hat{y}$ )
100	505	492.1	12.9
90	406	447.1	-41.1
80	415	402.1	12.9
70	360	357.1	2.9
60	305	312.1	-7.1
50	265	267.1	-2.1



\*Be careful when plotting the residuals!

Start with x = 50 first

Does the residual plot suggest a linear relationship? Explain.

yes  $\rightarrow$  it is randomly scattered