



**Target 5A:** Determine the model that would best represent a data set and analyze residual plots from the data to determine if the function is an appropriate fit.

1. Determine which kind of function best models the data. (1 point)

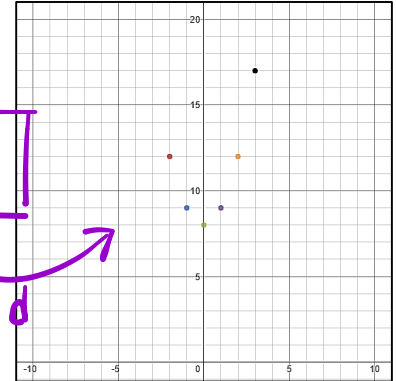
$x$	$f(x)$
-2	12
-1	9
0	8
1	9
2	12
3	17

$\left. \begin{matrix} -3 \\ -1 \\ +1 \\ +3 \\ +5 \end{matrix} \right\} \begin{matrix} +2 \\ +2 \\ +2 \\ +2 \\ +2 \end{matrix}$

Constant 2<sup>nd</sup> Difference

**QUADRATIC**

when plotted



2. When finding the best fit linear equation, which of the following are we trying to MINIMIZE? (1 point)

- A. The range of the residuals
- B. The sum of the squares of the residuals
- C. The sum of the dependent variable
- D. The sum of the residuals

3. Determine which kind of function best models the data. (1 point)

$x$	$y$
-2	$\frac{1}{64}$
-1	$\frac{1}{8}$
0	1
1	8
2	64

$\left. \begin{matrix} \times 8 \\ \times 8 \\ \times 8 \\ \times 8 \end{matrix} \right\}$

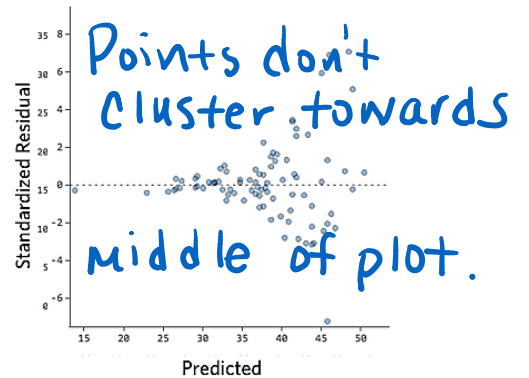
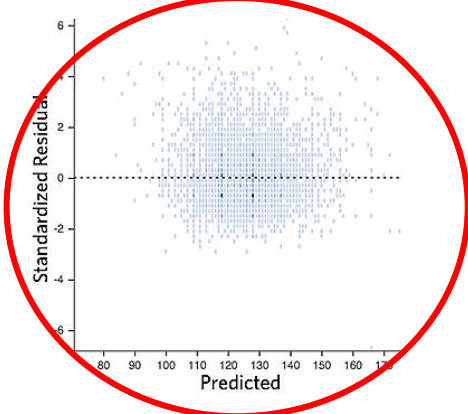
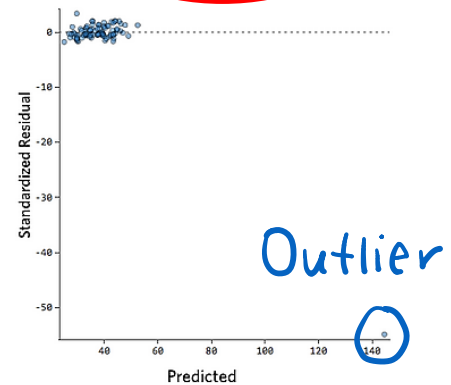
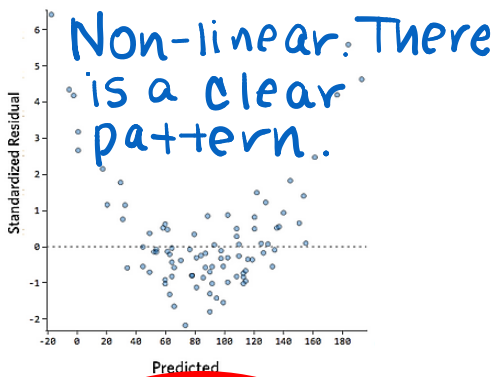
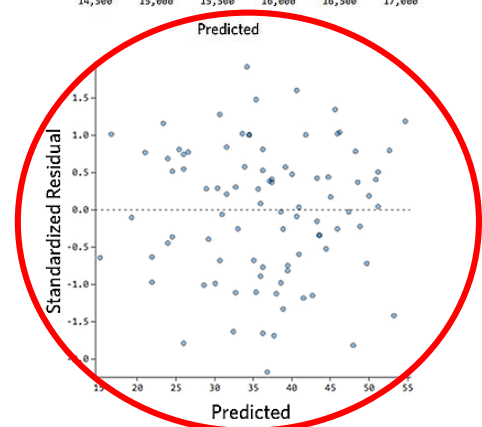
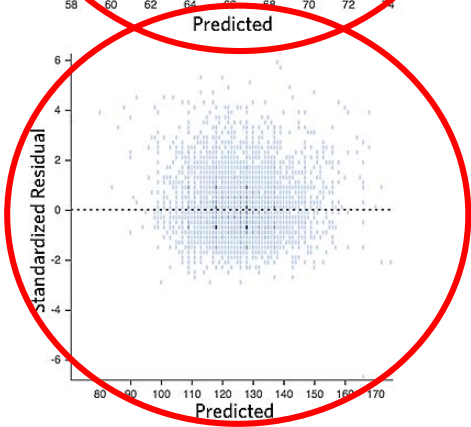
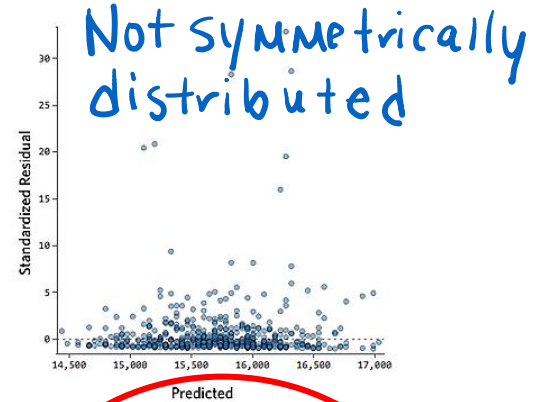
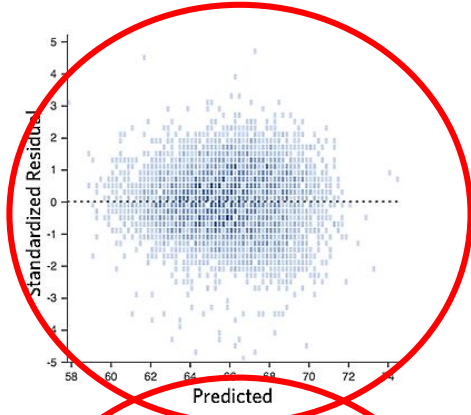
Constant Ratio

**EXPONENTIAL**

4. Residual plots should meet the following requirements:

- Symmetrically distributed, tending to cluster towards the middle of the plot
- Clustered around the lower single digits of the y-axis (e.g., 0.5 or 1.5, not 30 or 150)
- In general, there aren't clear patterns.

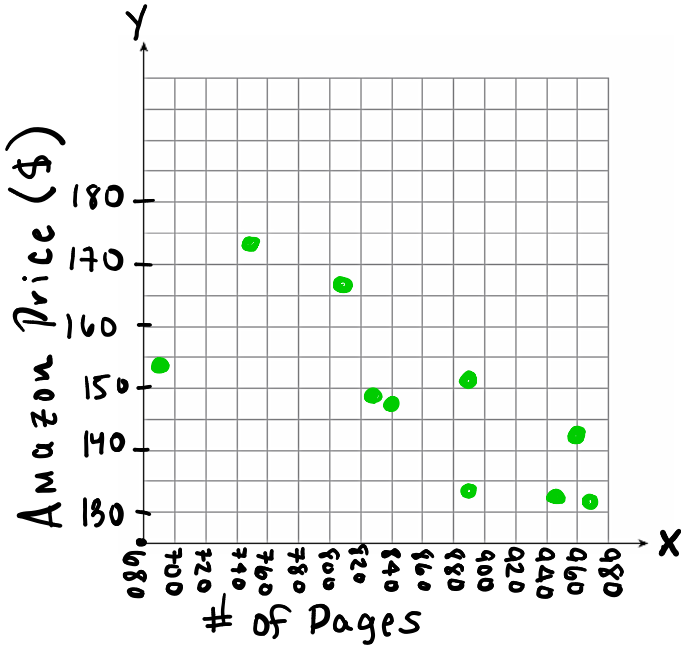
Circle the residual plots that meet this criteria. (3 points) Explain why the un-circled plots do NOT meet the criteria.



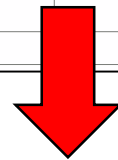
5. The table consists of the Amazon.com prices of ten commonly adopted introductory statistics textbooks (in \$) paired with the page count for each textbook. (3 points)

Textbook	1	2	3	4	5	6	7	8	9	10
Pages ( $x$ )	694	896	960	840	896	976	944	832	814	752
Amazon Price ( $y$ )	153.33	134.49	142.56	147.56	150.31	131.99	133.99	147.09	166.25	173.49

- a) Sketch a scatter plot of the data below (label axes):



A	pages	B	price	C	D	E
=						=LinRegM
1	694	153.33		Title		Linear R...
2	896	134.49		RegEqn	$m*x+b$	
3	960	142.56		$m$	-0.1114...	
4	840	147.56		$b$	243.956...	
5	896	150.31		$r^2$	0.55792...	
6	976	131.99		$r$	-0.7469...	
7	944	133.99		Resid	{-13.313...	
8	832	147.09				
9	814	166.25				
10	752	173.49				



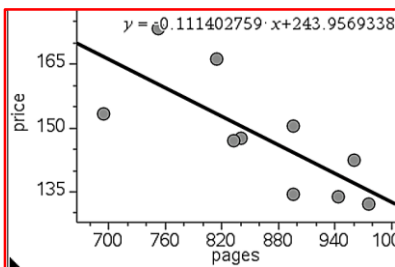
- b) Using technology, determine the equation ( $y = mx + b$ ) of the line of best fit.  $y = 0. -1114x + 243.9569$  (TI-Nspire: Add Lists & Spreadsheet, enter data, Menu, 4, 1, 3)
- c) Using technology, graph the residual plot. Sketch it below. Label your axes.

**STEP #1:**

**Graph scatterplot:** DOC, 4: Insert, 7: Data & Statistics, put  $x$  and  $y$  on axes

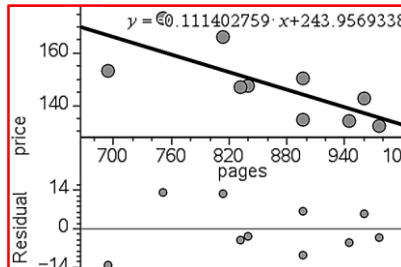
**Graph linear regression line:**

MENU, 4: Analyze, 6: Regression, 1: Show Linear ( $mx+b$ )



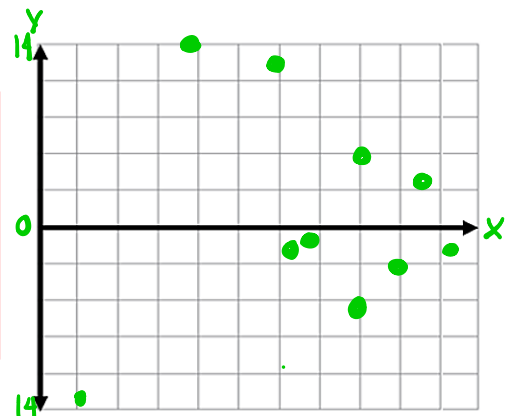
**STEP #2:**

**Graph residual plot:** MENU, 4: Analyze, 7: Residuals, 2: Show residual plot)



**STEP #3:**

**Draw residual plot below:** (sketch the same graph that is on your calculator)



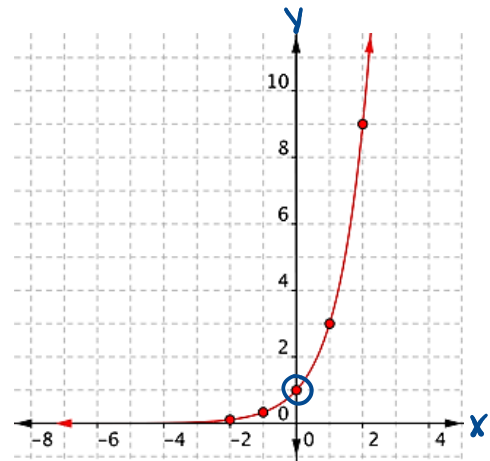
**Target 5B:** Interpret the key features of quadratic and exponential functions, represented graphically.

6. Answer the questions below in regards to key features of a graph: (1 point)

a) Is the function INCREASING or DECREASING?

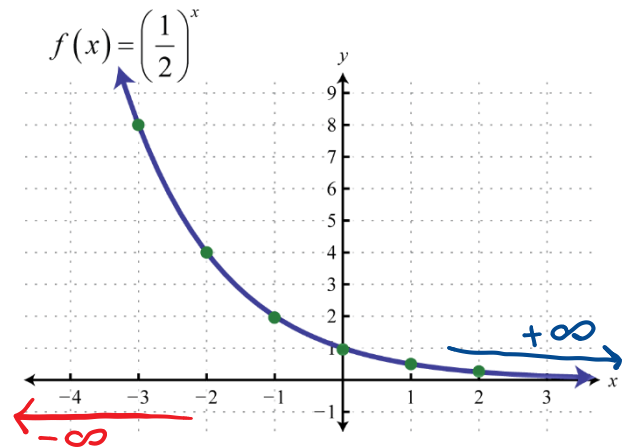
INCREASING

b) Identify the y-intercept: (where graph crosses y-axis)  
 $y = 1$



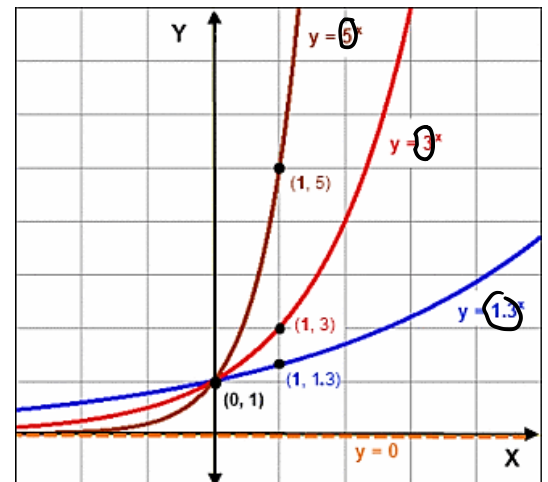
7. Describe the end behavior of the graph below. (1 point)

As  $x \rightarrow +\infty$ ,  $f(x) \rightarrow 0$  and  
 As  $x \rightarrow -\infty$ ,  $f(x) \rightarrow +\infty$



8. What happens to exponential functions as the common ratio increases? (1 point)

As common ratio increases,  
 there is a vertical  
 shrink (AKA: graph gets  
 steeper!)



9. Abby plots the height of a ball thrown under the influence of gravity, ignoring air resistance. The ball begins at ground level, and the graph models the height of the ball, in centimeters, with respect to the number of seconds that has passed. (3 points)

- a) Determine the function of the quadratic, in vertex form.

$$f(x) = a(x-h)^2 + k$$

$$f(x) = a(x-2)^2 + 2000$$

plug in a point to solve for "a"

$$0 = a(0-2)^2 + 2000$$

$$0 = a(-2)^2 + 2000$$

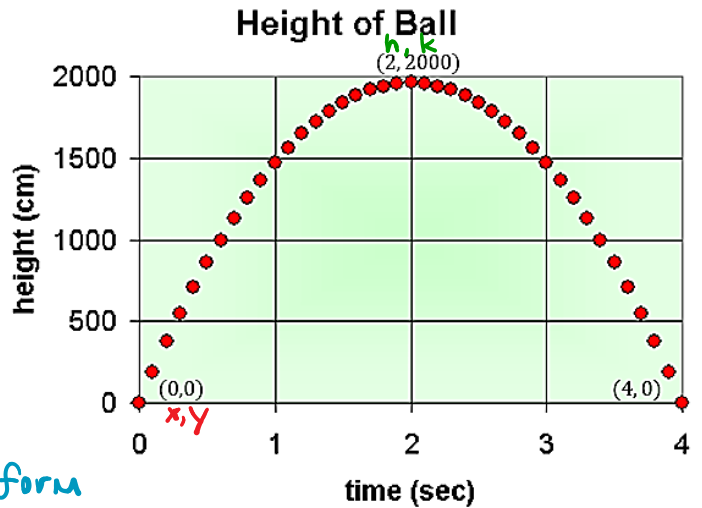
$$0 = 4a + 2000$$

$$-2000 = 4a$$

$$-500 = a$$

Plug "a" back into vertex form for answer

$$f(x) = -500(x-2)^2 + 2000$$

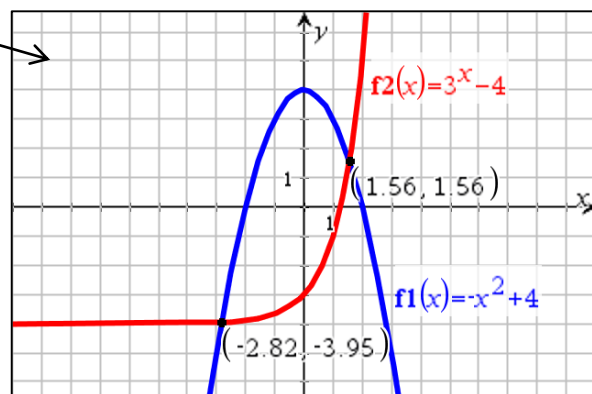
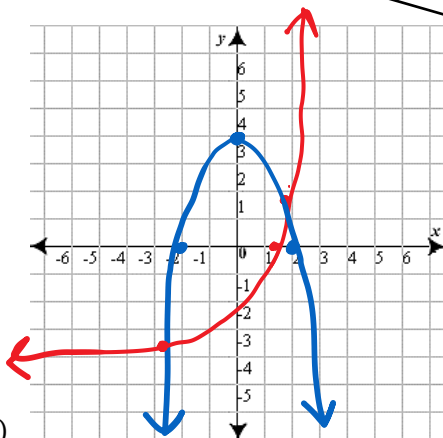


- b) Give and explain one key feature of this graph, using units.

After 2 seconds, the ball reaches its maximum height of 2000 cm before it begins to fall back down to the ground.

10. Using technology, graph the following functions. Then, answer the questions that follow. (3 points)

$$f_1(x) = -x^2 + 4 \text{ and } f_2(x) = 3^x - 4.$$



a)

- b) Determine the number of solutions.

2 solutions

- c) List the coordinates  $(x, y)$  of the solutions.

$(1.56, 1.56)$  and  $(-2.82, -3.95)$

(TI Nspire: Menu, 6: Analyze Graph, 4: Intersection)