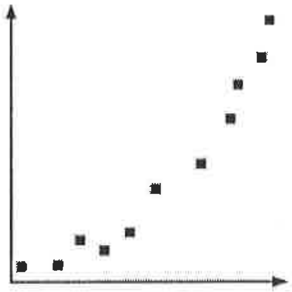
Notes: Other Regressions Name: ______________________

Objective: SWBAT find a model that fits the data.

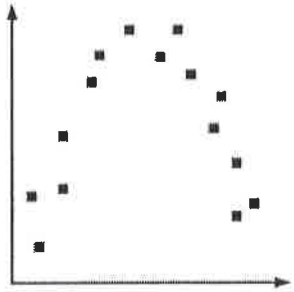
***Exercise* #1:** For each scatterplot shown below, determine if it is best fit with a linear, exponential, or quadratic function. Draw a curve of best fit depending on your choice.

(a)



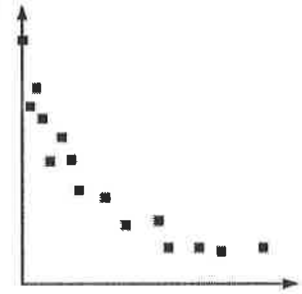
Type: exponential

(b)



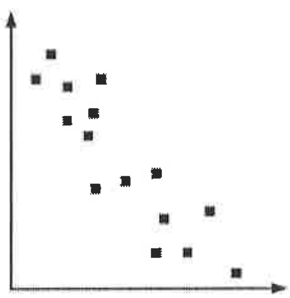
Type: quadratic

(c)



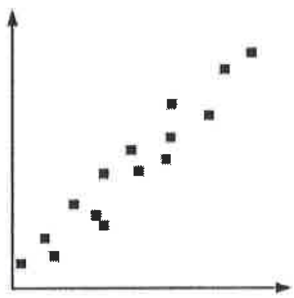
Type: exponential

(d)



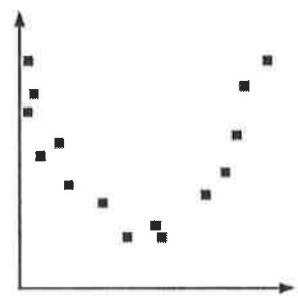
Type: linear

(e)



Type: linear

(f)



Type: quadratic

- Our calculators can produce equations for exponentials of best fit and quadratics of best fit (along with a lot of other types of curves).

Exercise #2: Biologists are modeling the number of flu cases as it spreads around a particular city. The total number of cases, y, was recorded each day, x. The data for the first week is shown in the table below.

x, days	0	1	3	4	6	7
y, cases	2	3	7	10	23	34

a) Looking at the scatter plot, what type of function will best fit the data?

exponential

b) Use your calculator to find the regression equation for this data set. Round all parameters to the nearest hundredth.

$y = 2.01(1.50)^x$

c) Based on the regression equation, how many total cases of flu will there be after two weeks?

2 weeks = 14 days $y = 2.01(1.5)^{14}$

$y = 586$ cases

Exercise #3: The cost per widget produced by a factory generally drops as more are produced but then starts to rise again due to overtime costs and wear on the equipment. Quality control engineers recorded data on the cost per widget compared to the number of widgets produced. Their data is shown below.

Number of widgets, x	35	88	110	135	154	190
Cost per widget, y	9.32	2.63	1.42	1.32	2.12	5.50

a) Why should a quadratic model be considered for this data set as opposed to linear or exponential?

the set of data in a scatter plot resembles a parabola

b) Use your calculator to create a scatterplot of this data to verify its quadratic nature.

c) Use your calculator to find the regression equation for this data set. Round all parameters to the nearest hundredth.

$y = x^2 - 0.25x + 16.86$

d) Based on the regression equation, what would the cost per widget be if there were only 10 widgets?

$y = (10)^2 - 0.25(10) + 16.86$

$y = 114.36$ dollars

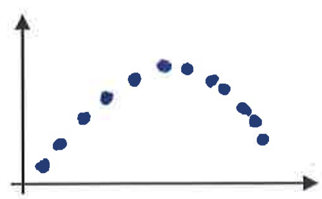
Exercise #4: The table below shows the horizontal distance (in feet) traveled by a baseball hit at various angles. The initial speed of the ball at the bat is constant. Batter up!!!

Angle (degrees)	Distance (feet)
10°	115.6
15°	157.2
20°	189.2
24°	220.8
30°	253.8
34°	269.2
40°	284.8
45°	285.0
48°	277.4
50°	269.2
58°	244.2
60°	231.4
64°	180.4

a) Create a scatter plot of the data.

b) What regression model would best represent this data? Write the equation and sketch the graph of the equation.

$y = -0.17x^2 + 14.52x - 21.90$



c) What distance will correspond to an angle of a 5°?

$y = -0.17(5)^2 + 14.52(5) - 21.9$ $y = 46.5$ feet

d) The left field fence is 280 feet from home plate. At what angle, or angles, to the *nearest degree*, will the ball be hit past the left field fence?

$280 = -0.17x^2 + 14.52 - 21.9$

$-280 \qquad -280$

$0 = -0.17x^2 + 14.52x - 301.9$

$a = -0.17$

$b = 14.52$

$c = -301.9$

$$\frac{-14.52 \pm \sqrt{(14.52)^2 - 4(-.17)(-301.9)}}{2(-0.17)} = \frac{-14.52 \pm 2.35}{-0.34}$$

$$\frac{-14.52 + 2.35}{-.34} = 35.8 \quad = 36°$$

$$\frac{-14.52 - 2.35}{-.34} = 49.6 \quad = 50°$$