Quadratics | Review

Functions:

-use the vertical line test to determine whether a graph represents a function or not

Domain (x) and Range (y):

The first set of numbers in a relation is the domain. The second set is the range. These can also determine whether this is a function or not. $\{(-2,5), (3,4), (3,-1), (4,-5)\}$

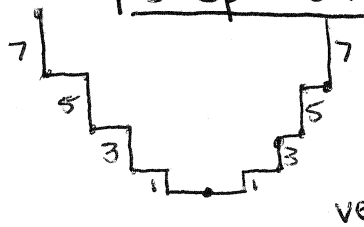
This doesn't represent a function, because there are two x-values of 3 and for both of those x-values there are two different y-values.

Also for every parabola the domain is all real numbers and the range is all real numbers with a maximum or minimum.

Steps for Graphing

1. Plot the vertex at (0, k)
2. Multiply the origin by the **Step Pattern**
3. Use the **Step Pattern** to plot your points
4. Connect the dots curvy style

Step Pattern



When a is (+) you have a MIN and when a is (-) you have a MAX

When a is larger than 1 you have a vertical stretch and when a is smaller than 1 you have a vertical compression.

Completing the Square

1. Determine what must be added to $x^2 + bx$ to make it a perfect square trinomial (square half coefficient of x)
2. Add and subtract the number found in Step One to the original equation.
3. Group the perfect square trinomial
4. Factor the perfect squar trinomial and include the remaining constant at the end.

Ex.

1. $y = 3x^2 - 12x + 11$
2. $y = 0.5x^2 - 24x + 64$

$y = 3(x^2 - 4) + 11$ → $y = 3(x^2 + 4x + 4 - 4) + 11$

$y = 3[(x-2)^2 - 4] + 11$

$y = 3(x-2)^2 - 12 + 11$

$y = 3(x-2)^2 - 1$

Finite Differences

The differences between y-values in a table of values. If the <u>first differences</u> are equal the equation is a **line.** If the <u>second differences</u> are equal the equation is a **parabola.** To find the a-value, divide second differences by 2.

Ex. Find the equation of the parabola

x	y		
-3	-9		
-2	-7	-2	
		2	-4
-1	-9		
		6	-4
0	-15		
		10	-4
1	-25		
		14	-4
2	-39		
		18	-4
3	-57		

MAX

y-int

$-4 \div 2 = -2$

$\boxed{a = -2}$

$y = -2(x+2) - 7$

k, h

k and h shift the vertex up, down, left and right.

$$y = a(x-h)+k$$

↳ h shifts the vertex left and right.

↳ k shifts the vertex up and down.

$$y = a(x-4)+11$$

↳ h would shift the quadratic 4 places to the right. Since you subtract (+4).

↳ k would shift the quadratic 11 places up.

***the (-) and (+) can be confusing when looking at h. But remember that in the original formula we have to subtract h. So if h is negative we add it: $y = a(x-(-h))+k$

↳ same as $(x+h)$

And if h is positive we subtract it:

$y = a(x-(+h))+k$

↳ same as $(x-h)$

Application/Maximization

Riverboat Cruise.

The Captain of a riverboat cruise charges $36 per. person, including lunch. The cruise averages 300 customers per day. The captain is considering increasing the price.

A survey of customers indicates that for every $2 increase, there would be 10 fewer customers. What increase in price would maximize the revenue?