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Graphing Parabolas of the Form $y = (x - h)^2$

Equation: $y = (x + 2)^2$

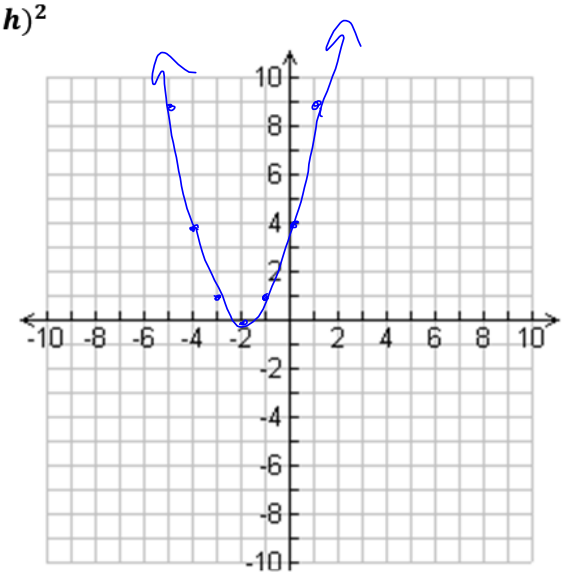
x	y
-4	4
-3	1
-2	0
-1	1
0	4
1	9
2	16

h = -2

Vertex: (-2, 0) **Zeroes:** -2

Step Pattern: 1, 3, 5, 7...

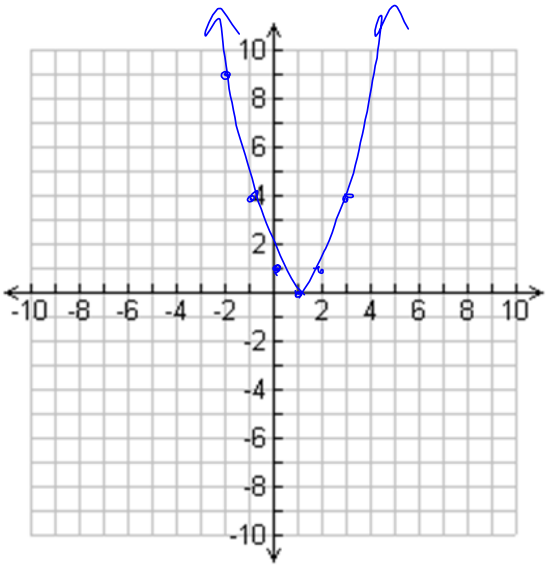
Direction of Opening: up



Equation: $y = (x - 1)^2$

x	y
-3	16
-2	9
-1	4
0	1
1	0
2	1
3	4

h = 1



Vertex: (1, 0) **Zeroes:** 1

Step Pattern: 1, 3, 5, 7...

Direction of Opening: up

Summary

The graph of $y = (x - h)^2$ is the graph of $y = x^2$ shifted to right/left h units.

The step pattern will be 1, 3, 5, 7... . The vertex will be at (h, 0).

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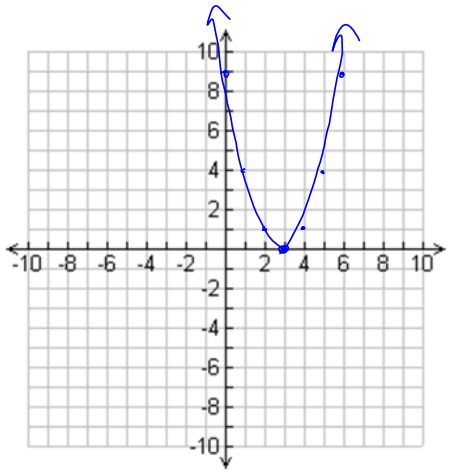
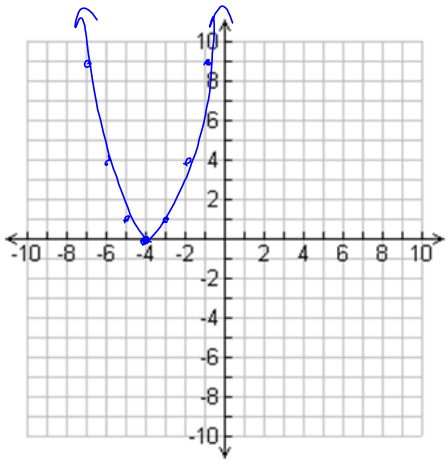
Sketch each graph below without making a table of values.

$y = (x - 3)^2$



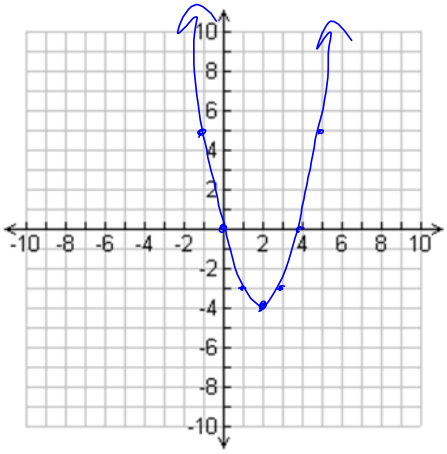
$y = (x + 4)^2$



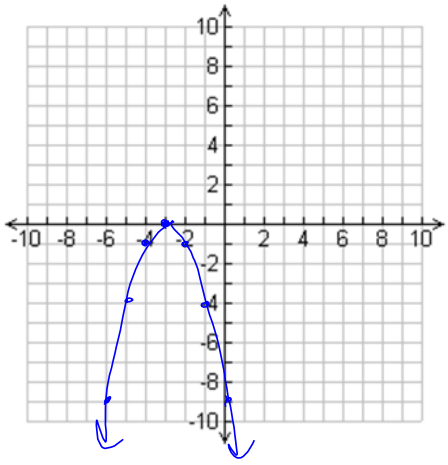
How about combining a couple of transformations? Try to graph the following without making a table of values. Check at least one point on your graph with the equation.

$y = (x - 2)^2 - 4$

(2, -4)



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



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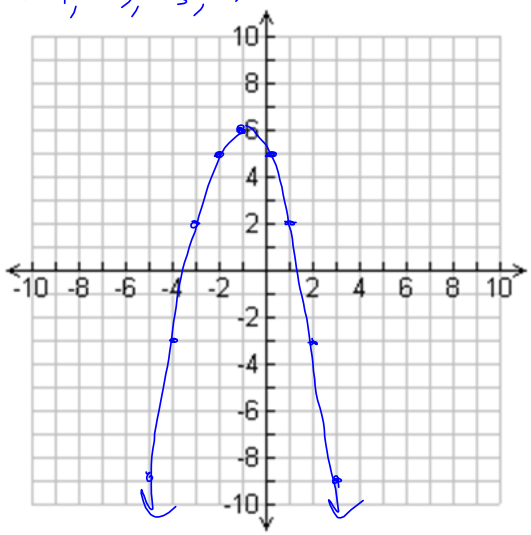
Putting it All Together – The Vertex Form of a Parabola

We can combine everything we have learned over the last 3 lessons to graph any quadratic relationship with an equation of the form $y = a(x - h)^2 + k$.

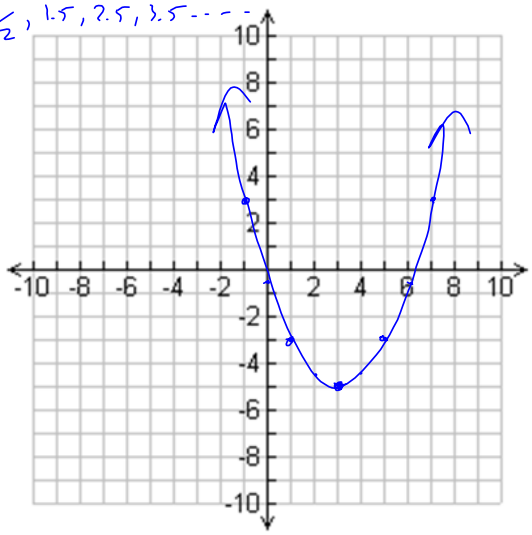
To graph quadratic equations in this form, start with the graph of $y = x^2$ and:

Examples Sketch each of the following. Describe the transformations below the graph.

$y = -(x + 1)^2 + 6$



$y = 0.5(x - 3)^2 - 5$



Why do you think the $y = a(x - h)^2 + k$ is referred to as *vertex form*?

$y = 3(x - 4)^2 + 10$

$y = -(x + 4)^2 - 1$

$y = 3x^2 + 12$

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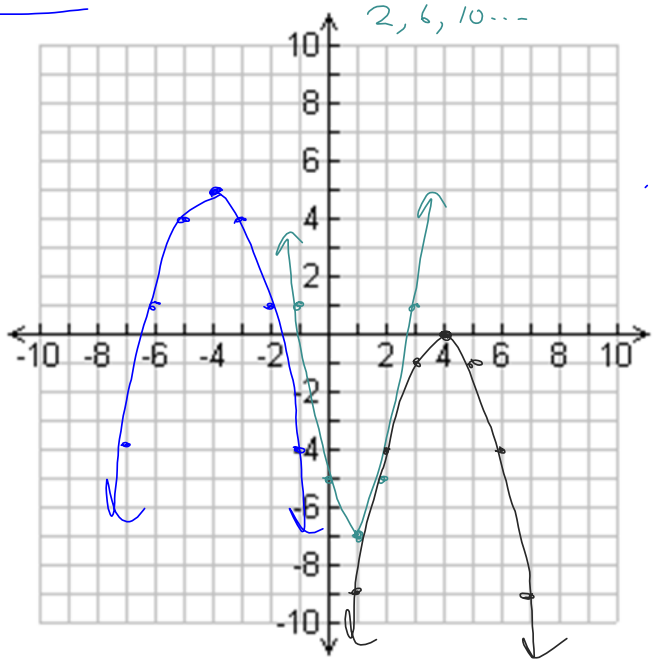
Graph the following.

$y = -(x+4)^2 + 5$ $y = 2(x-1)^2 - 7$ $y = -(x-4)^2$

2, 6, 10...

1, 3, 5, ...

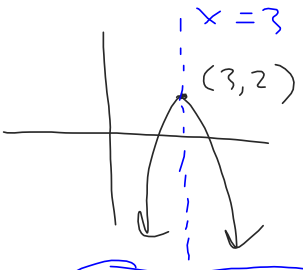


Draw a very rough sketch of the parabola below. State the max/min value, the vertex and the axis of symmetry. $x = 3$

$y \leq 2$ $(3, 2)$

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

$y = 2$ is a maximum



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