

2.4 A Graphing in Vertex Form

Recall: Equation of a parabola in vertex form is $y = a(x - h)^2 + k$

We saw yesterday how **a**, **h**, and **k** changed the graph of $y = x^2$

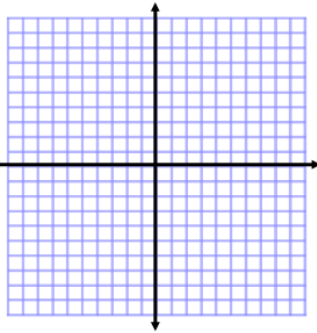
a: **h:** **k:**

Graphing Quadratic Equations - The Pattern Method

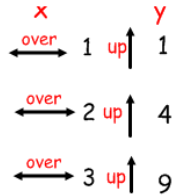
Consider $y = x^2$

X	Y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9

Matching heights and distances: symmetry!



From vertex get the pattern:

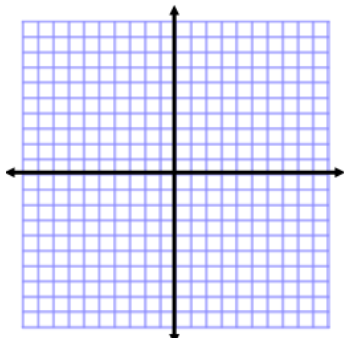


How to Graph Using the Pattern Method

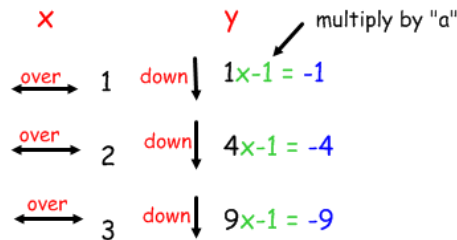
1. Identify and plot the _____ (h, k)
2. Determine the step _____
3. _____ the step points
4. Reflect each point across the _____
5. Draw a _____ curve between points

Ex 1: Sketch $y = -x^2$

- vertex at (0,0) **start here**
- $a = -1$, opens down



Use the STEP Pattern from the vertex



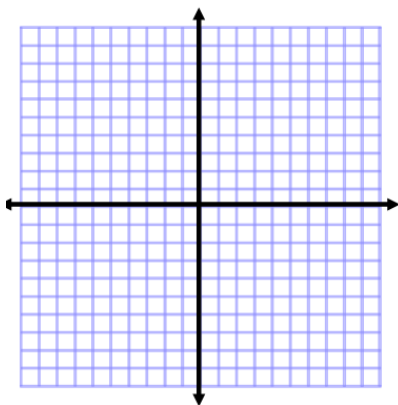
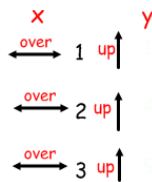
Ex 2: Vertical Stretches

- makes graph "skinnier"
- vertical stretch by 2
- makes graph "wider"
- vertical squish by $\frac{1}{2}$

Sketch
a) $y = 2x^2$

vertex:
opens:

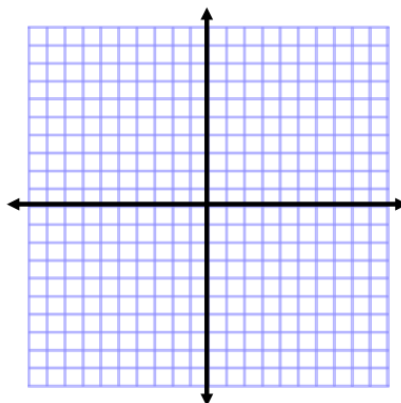
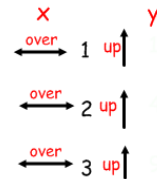
The Step Pattern From the vertex:



b) $y = \frac{1}{2}x^2$

vertex:
opens:

The Step Pattern From the vertex:



Ex 3: Horizontal Translations (Moves left or right)

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

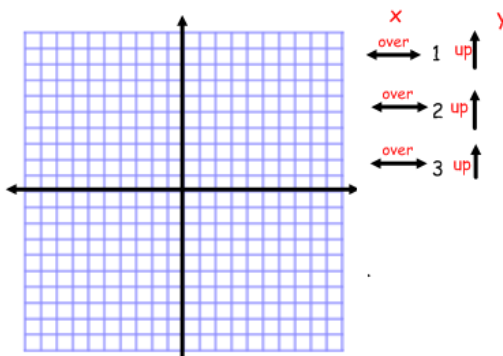
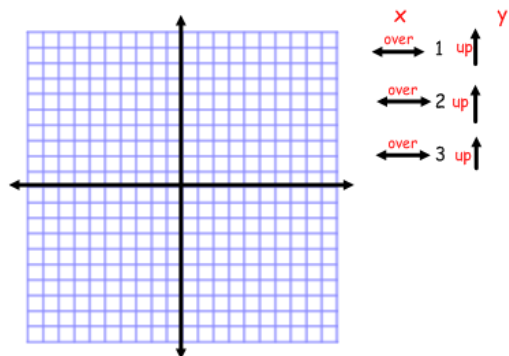
Sketch

a) $y=(x+2)^2$ vertex:
opens:

$h = -2$ so move **left 2 units**.

b) $y=(x-3)^2$ vertex:
opens:

$h = 3$ move **right 3 units**.



Ex 4: Vertical Translations (Move up or down)

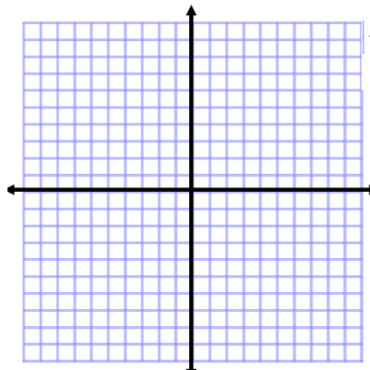
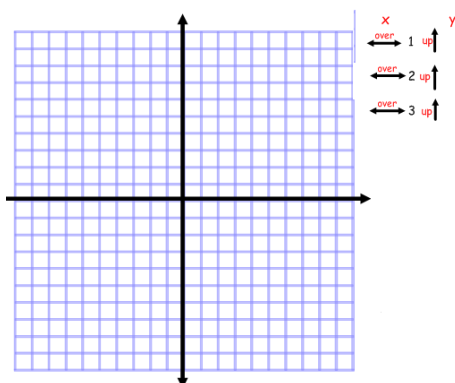
Sketch

a) $y=x^2-2$ vertex:
opens:

$k = -2$ move **down 2 units**.

b) $y=x^2+3$ vertex:
opens:

$k = 3$ move **up 3 units**.

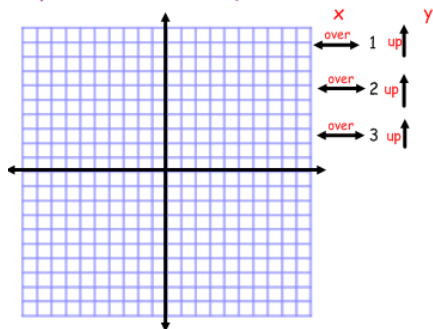


Ex. 5 For each relation i) State the vertex (h,k) ii) State the dir
iii) Graph the relation

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

vertex (h,k):

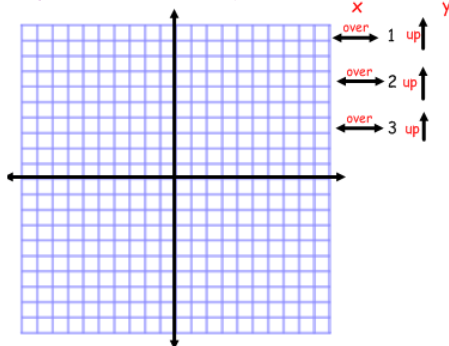
opens:stretch/squish (a):



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

vertex (h,k):

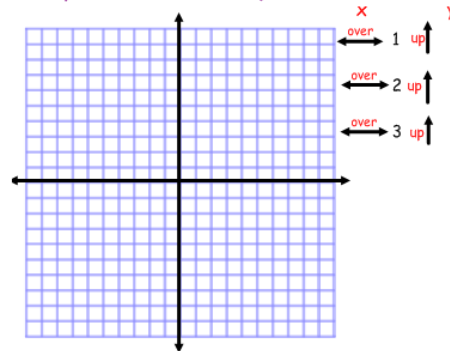
opens:stretch/squish (a):



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

vertex (h,k):

opens:stretch/squish (a):



State the transformations (in order)

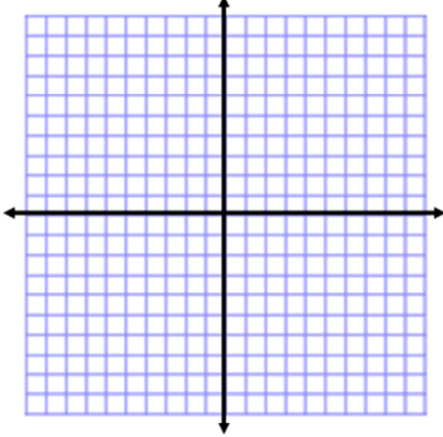
$$y = -5(x+7)^2 - 10$$

Practice Questions 2.4A

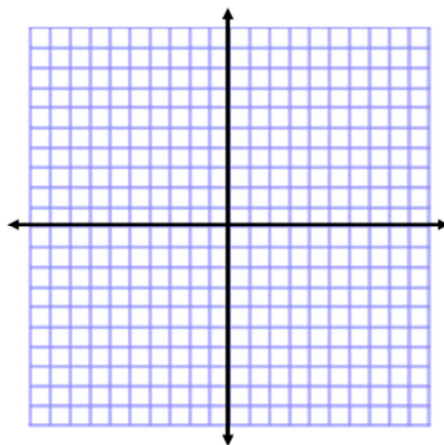
- Describe how to transform the graph of $y=x^2$ to produce the graph of each:
 - $y=(x-4)^2$
 - $y=x^2+4$
 - $y=(x+4)^2$
 - $y=x^2-4$
 - $y=8x^2$
 - $y=-8x^2$
 - $y=0.75x^2$
 - $y=-0.75x^2$
- Write an equation of the transformed parabola
 - Translated 6 units up
 - Translated 2 units right
 - Translated 1 unit down
 - Translated 3 units left
 - Stretch vertically by factor of 5
 - Reflected about the x-axis
 - No transformations
- Determine the coordinates of the vertex for each parabola from question 2.

4. Sketch a graph of each parabola without making a table of values.

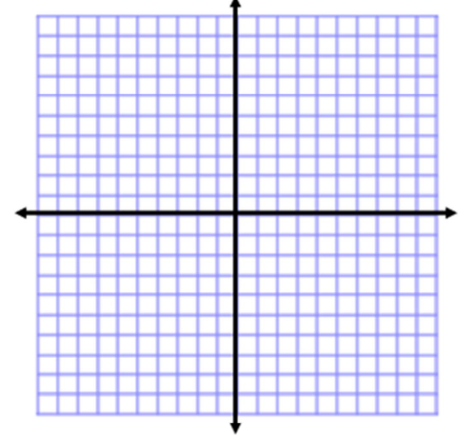
a) $y=(x-5)^2$



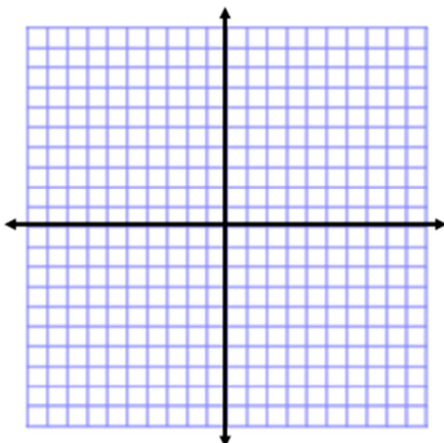
b) $y=x^2+1$



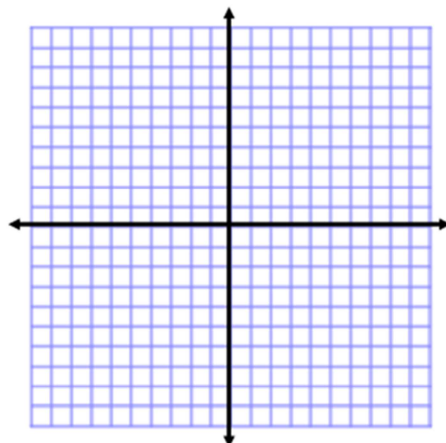
c) $y=-x^2$



d) $y=(x+2)^2$



e) $y=3x^2$



f) $y=-0.5x^2$

