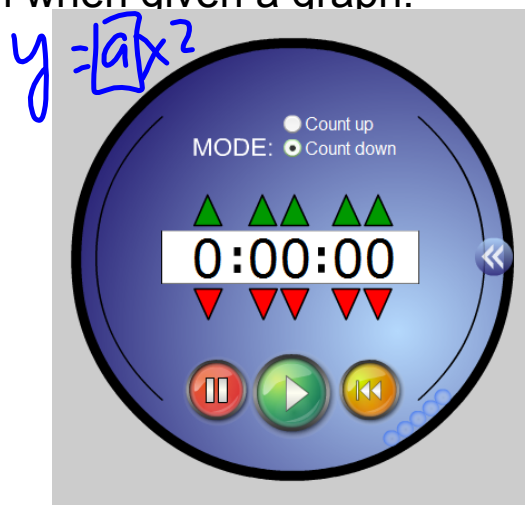
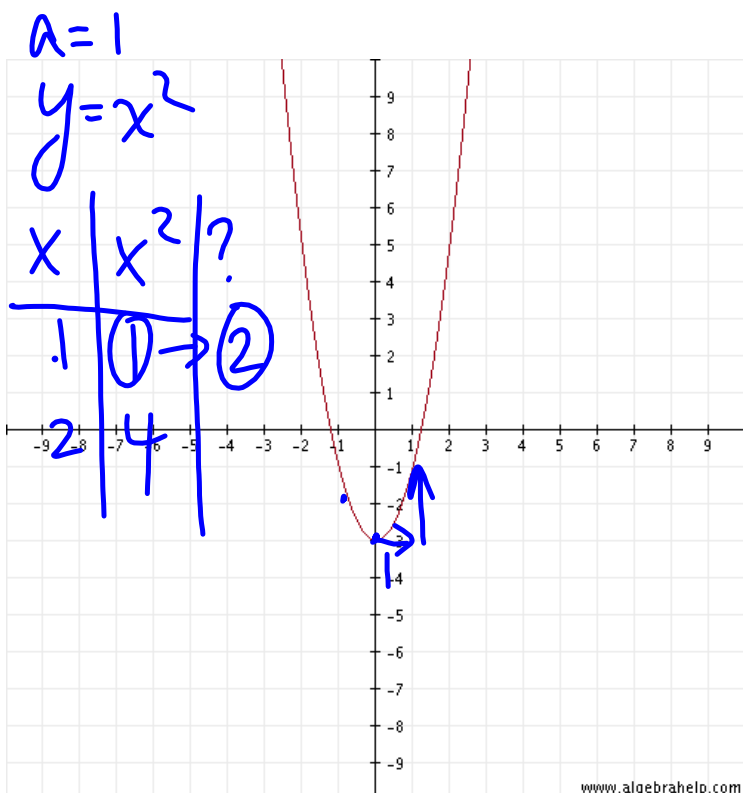
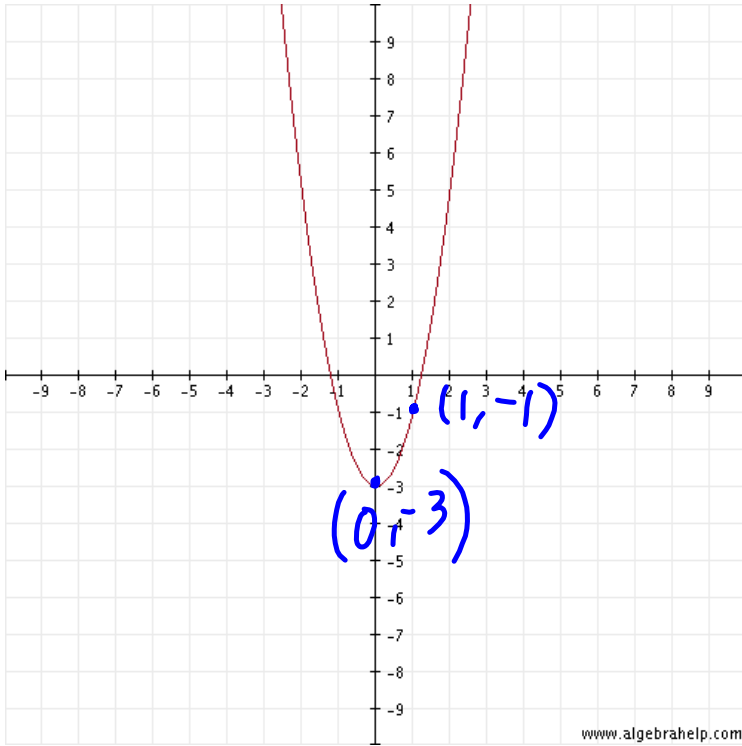


Write an equation of a quadratic relation when given a graph:



$y = (2)x^2 - 3$
 ↑ $a=2$



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

$$a = \quad h = 0 \quad k = -3$$

$x = 1 \quad y = -1$
 (one point and vertex given)

x	x^2	?
1	1	2

\curvearrowright
 $\times 2$
 $a = 2$

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

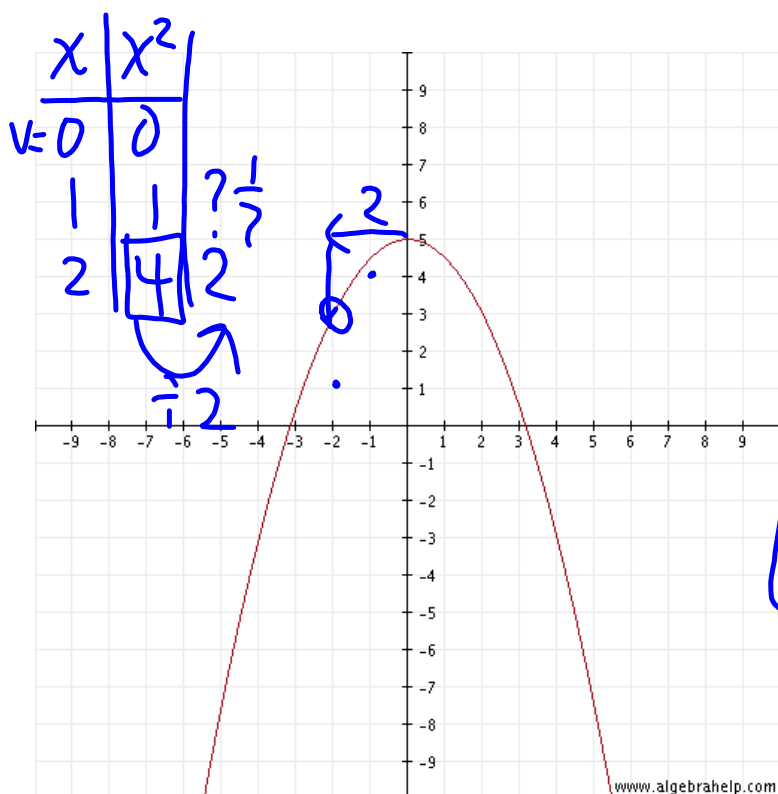
$$-1 = a(1-0)^2 - 3$$

$$-1 = a(1) - 3$$

$$-1 = a - 3$$

$$\begin{array}{r} +3 \qquad \qquad +3 \\ \hline 2 = a \end{array}$$

Write an equation of a quadratic relation when given a graph:

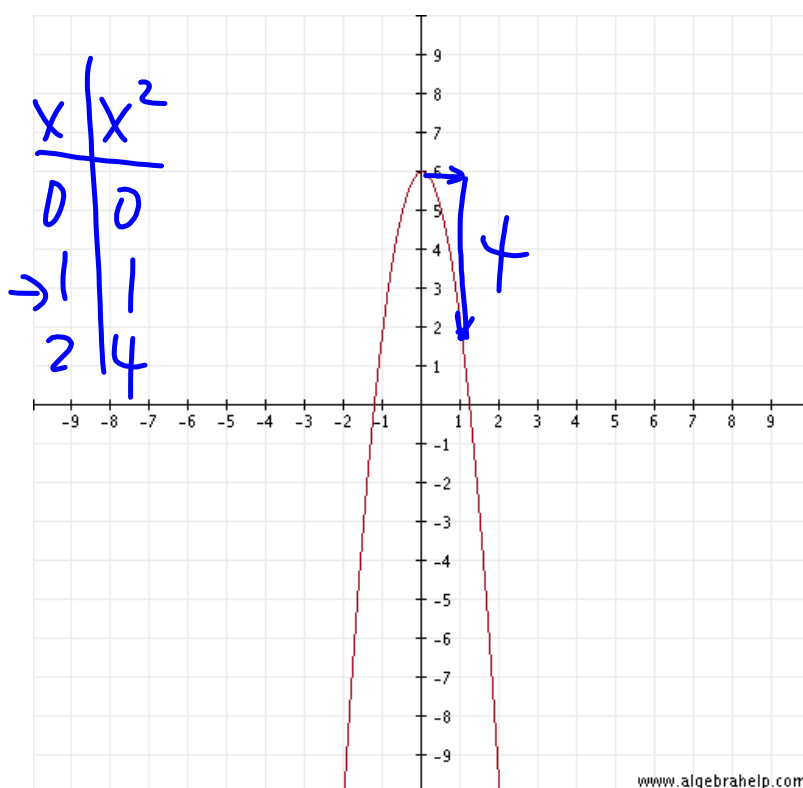


✓

$$y = -\frac{1}{2}x^2 + 5$$

$$y = \cancel{\frac{1}{2}}x^2 + 5$$

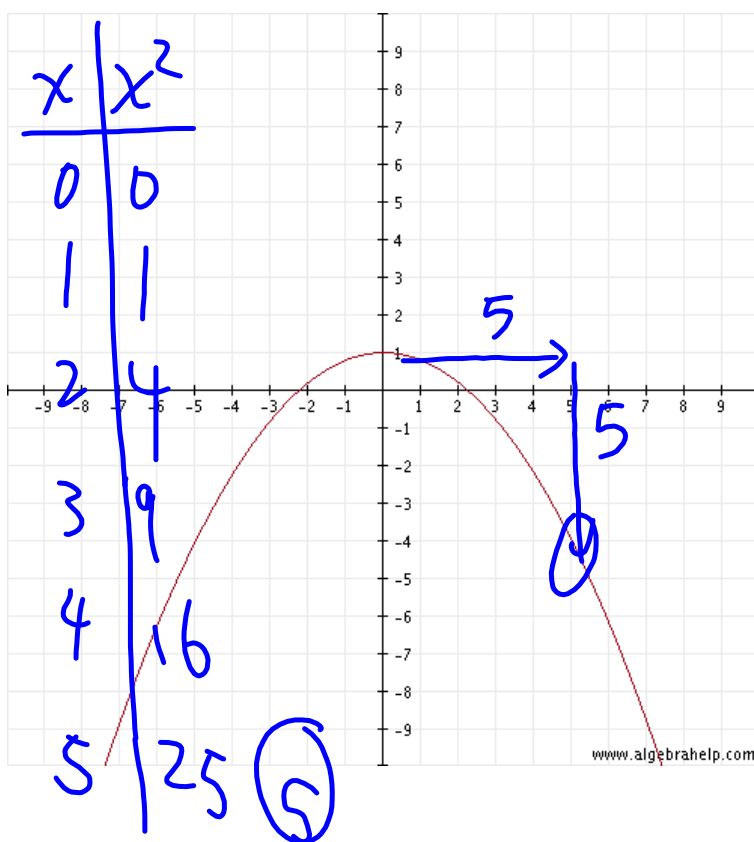
Write an equation of a quadratic relation when given a graph:



$$y = -4x^2 + 6$$

v

Write an equation of a quadratic relation when given a graph:



$$y = -\frac{1}{4}x^2 + 1$$

$$y = -\frac{1}{5}x^2 + 1$$

Worksheet 4-6: Quadratic Relations $y = a(x-h)^2 + k$

Review:

For each of the following parabolas,
 (a) state the coordinates of the vertex.
 (b) state the direction of the opening.

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

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

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

(iv) $y = 2(x+5)^2 - 3$

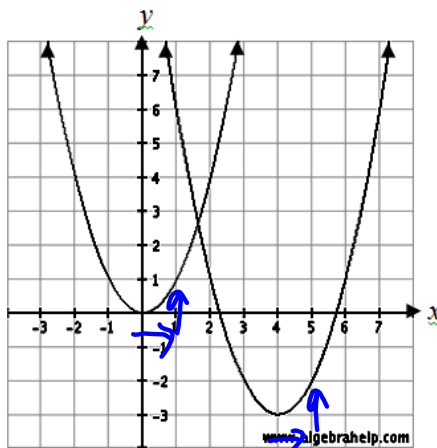
(a) (0,0) (a) (0,2) (a) (4,0) (a) (-5,-3)

(b) down (b) up (b) down (b) up

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

(a) Graph $y = x^2$ and $y = (x-4)^2 - 3$ on the same axes.

Compare the two parabolas, and describe the transformation.

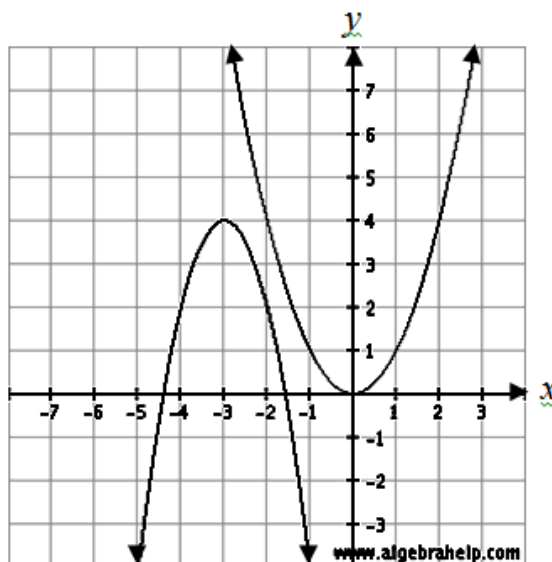


① $y = x^2$ is shifted vertically downward by 3 units. shifted down by 3 units

② it is shifted horizontally to the right by 4 units. shifted to the right by 4 units

(b) Graph $y = x^2$ and $y = -2(x + 3)^2 + 4$ on the same axes.

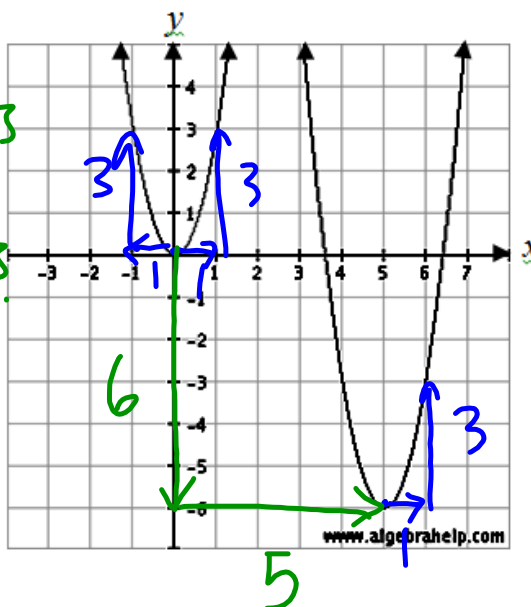
Compare the two parabolas, and describe the transformation.



- ① $y = x^2$ is reflected in the x -axis.
- ② It is vertically stretched by a factor of 2.
- ③ It is shifted down by 4 units.
- ④ It is shifted to the left by 3 units.

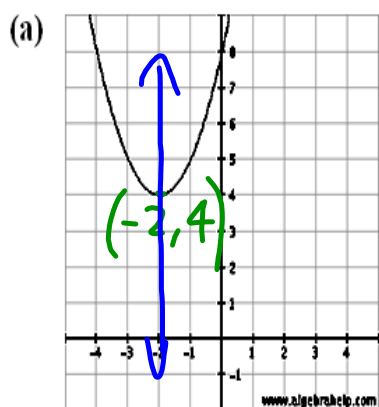
(c) Graph $y = 3x^2$ and $y = 3(x - 5)^2 - 6$ on the same axes.
 Compare the two parabolas, and describe the transformation.

- down by 6 units
 - right by 5 units



$y = x^2$
 ↓
 Stretch
 vertical
 by a
 factor
 of 3

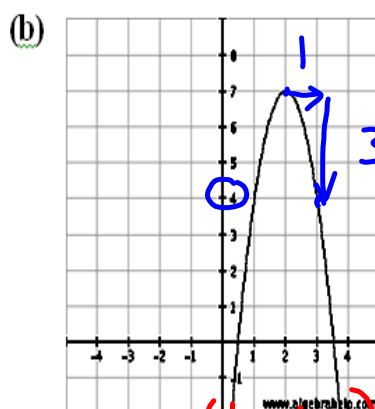
1. For each of the following parabolas, state the vertex, axis of symmetry and equation for the quadratic relation.



(h, k)
↑

$v = (-2, 4)$
axis of symmetry:
 $x = -2$

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

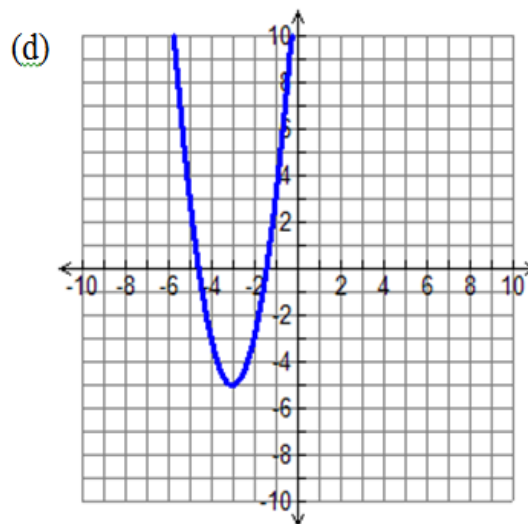
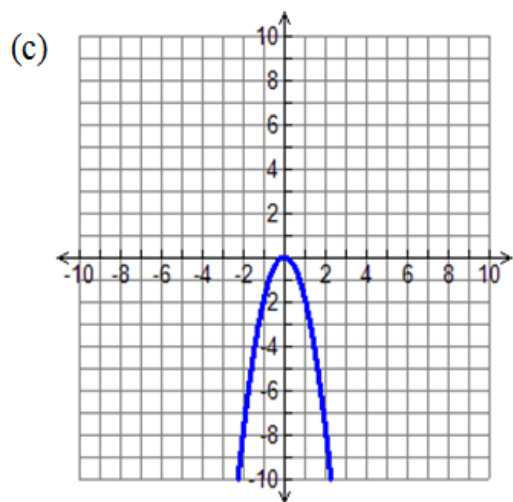
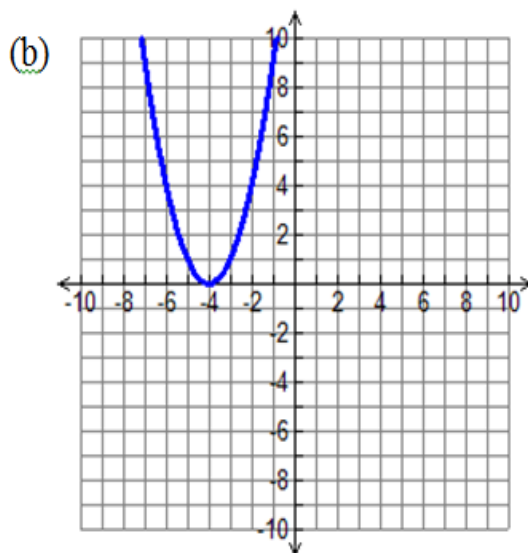
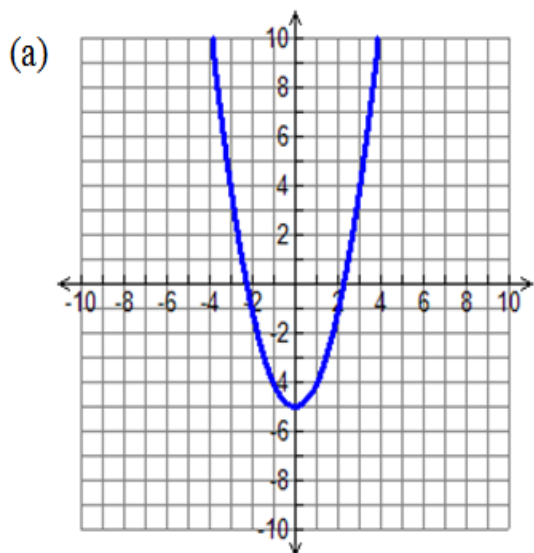


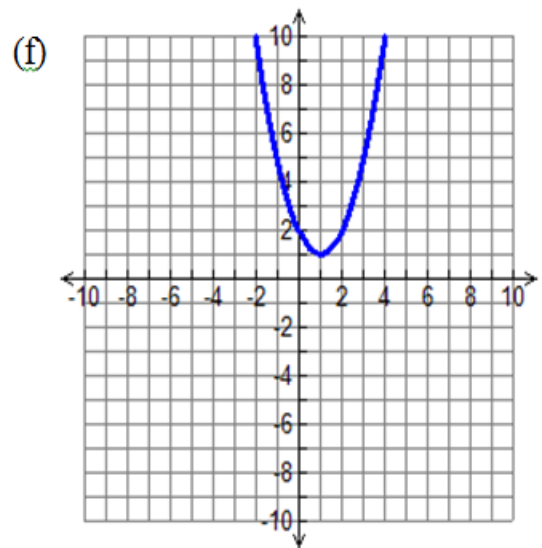
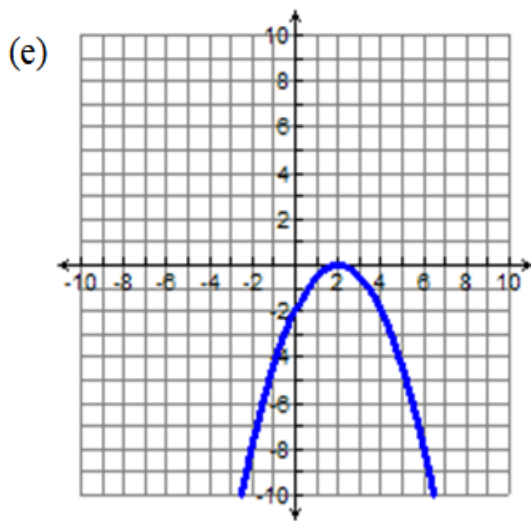
$\frac{1}{3}$
1
 $1 \times 3 = 3$
 $a = 3$

(h, k)
 $v = (2, 7)$
axis of symmetry:
 $x = 2$

$$y = -3(x - 2)^2 + 7$$

2. Write the quadratic equation, in vertex form " $y = a(x - h)^2 + k$ " for each graph.



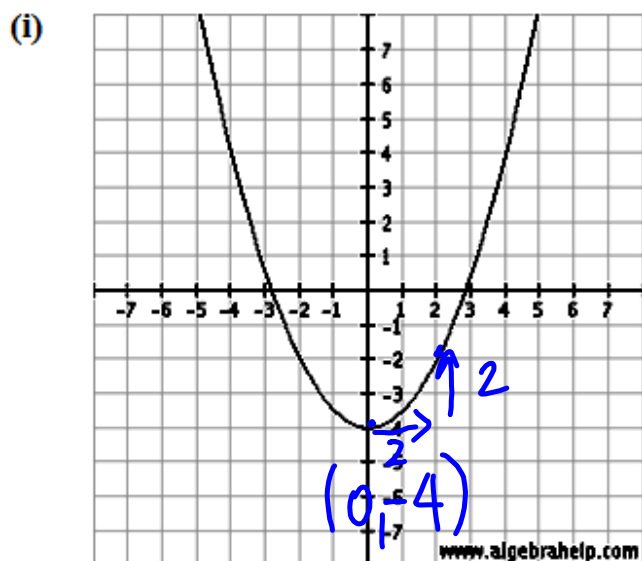


Transformations of Quadratic Relations

For each given parabola,

(a) describe, in words, its transformations from $y = x^2$ and

(b) write its equation in vertex form, $y = a(x - h)^2 + k$.



x	x^2	?
2	4	2

$\div 2$

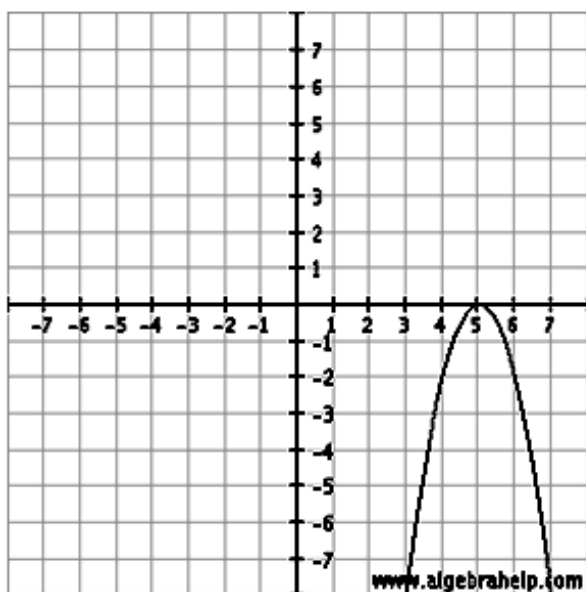
$a = \frac{1}{2}$

~~(c)~~ $y = x^2$ is vertically compressed
 (a) by a factor of $\frac{1}{2}$ and
~~(b)~~ shifted down by 4 units.
 (k)

$$y = \frac{1}{2}x^2 - 4$$

Vertically stretched when $a > 1$
" Compressed when $0 < a < 1$
reflected in x -axis when $a = -ve$

(ii)



$$a = 2$$

- (-ve) $y = x^2$ is reflected in the x -axis,
(a) vertically stretched by a factor of 2,
(h) and shifted to the right by 5.
~~(*)~~