

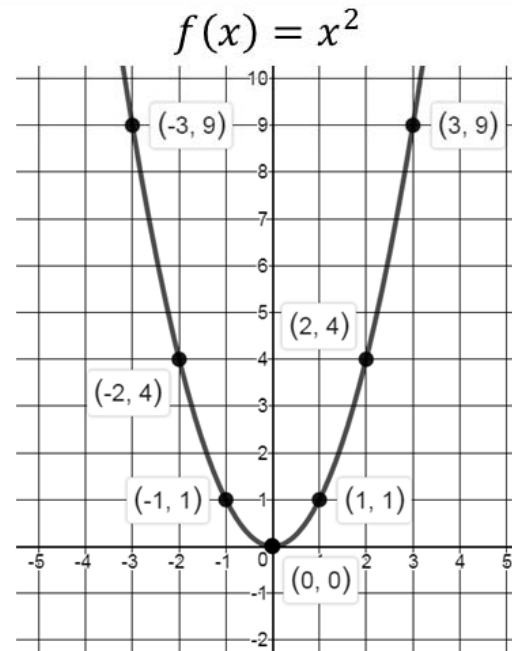
Objective: Graph a quadratic function using transformations from Vertex Form.

Concept

To determine the order in which transformations should be performed consider the Order of Operations. **Transformations that involve multiplication should be done first (reflections, stretches, compressions).** **Transformations that involve addition should be done second (translations right/left/up/down).** There are exceptions and variations to this procedure, but this procedure always works.

To graph a quadratic function (parabola) using transformations, you must know the graph of the parent function $f(x) = x^2$.

The point $(0,0)$ is only affected by translations. All other points are affected by all types of transformations.



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Concept

The Quadratic Function

vertex form

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

**One Procedure for Graphing a Parabola from Vertex Form
Using Transformations**

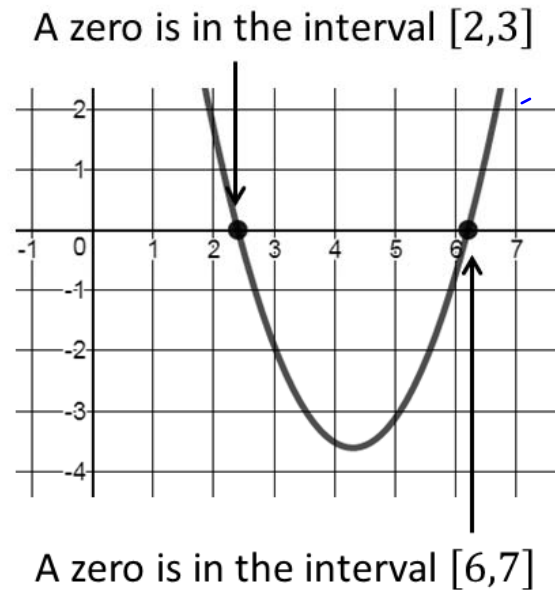
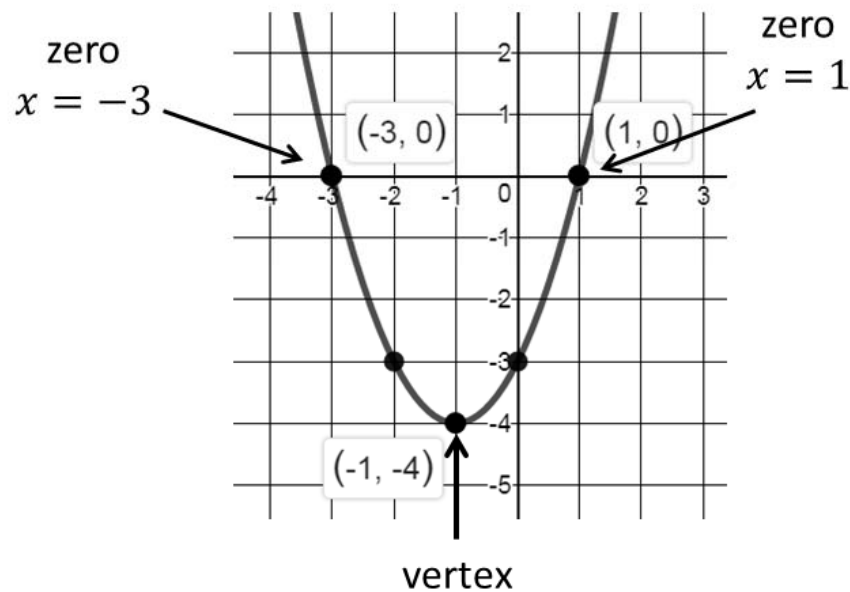
1. Determine the translations and graph the new vertex.
2. Draw a dashed horizontal line through the new vertex.
3. Perform any reflection, stretch, and/or compression on the other key points in the parent function using the line in step 2 as the reference line.
4. Draw in a smooth curve.



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Concept

Zeros of a function are values of the independent variable, x , that make the value of the function (corresponding y value) equal to 0. Zeros are found where the function intersects the x -axis.



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Ex) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

$$k(x) = 2(x + 5)^2 - 3$$

opp

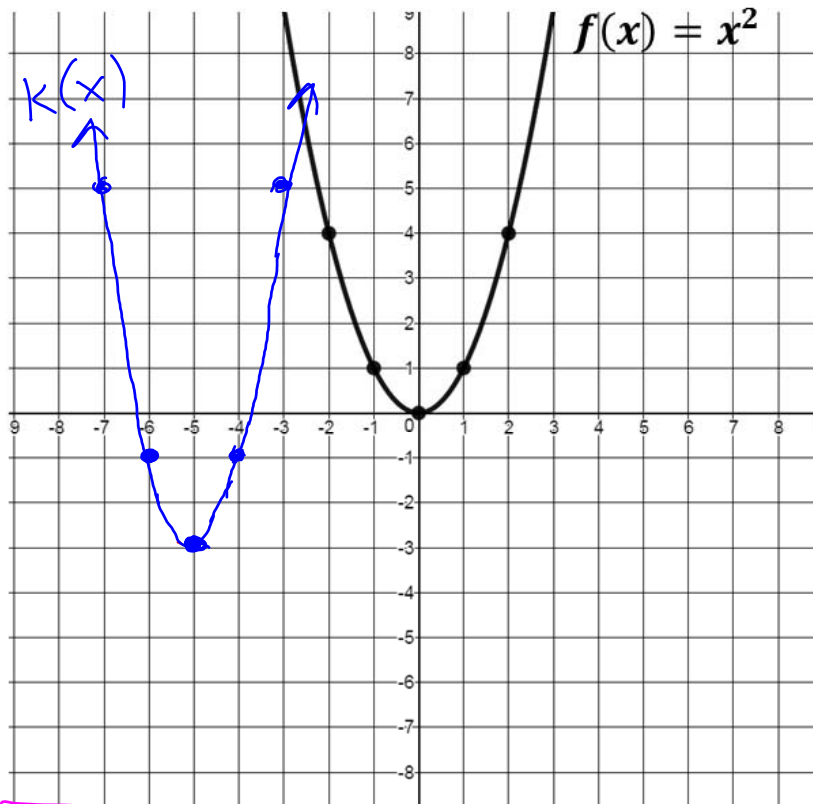
① $a = 2$ $h = -5$ $k = -3$
 stretch left 5 down 3

② translate $(0, 0)$

③ draw reference line

④ transform other points

B) vertex $(-5, -3)$
 minimum



C) zeros in $[-7, -6]$
 and $[-4, -3]$

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Ex) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

$$b(x) = -\frac{1}{2}(x - 3)^2 + 1$$

① $a = -\frac{1}{2}$ $h = 3$ $k = 1$

x-axis refl. comp.
right 3
up 1

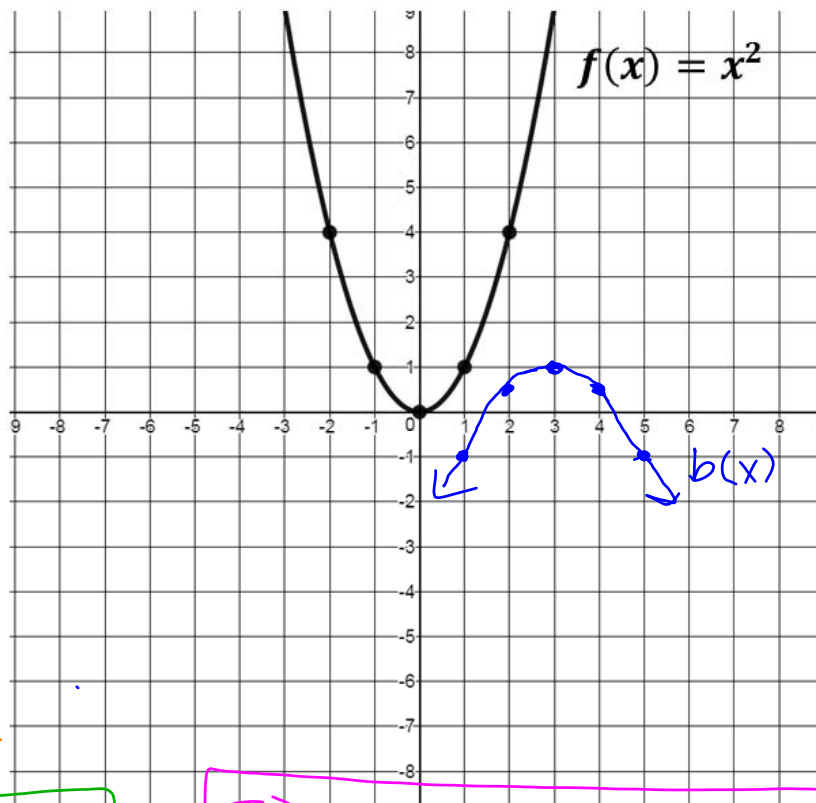
② translate (0,0)

③ draw reference line

④ transform other points

Ⓑ vertex (3,1)
maximum

Ⓒ zeros in [1,2]
and [4,5]

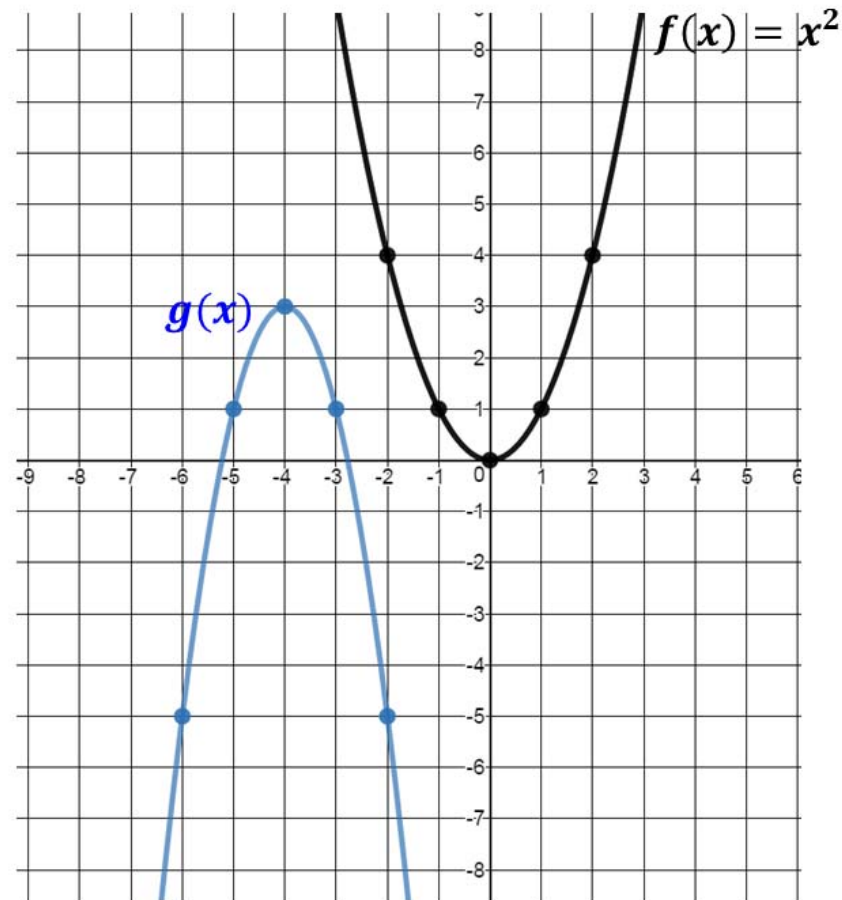


Objective: Graph a quadratic function using transformations from Vertex Form.

Practice) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

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

B) Vertex $(-4, 3)$; maximum
 C) The zeros are in the intervals $[-6, -5]$ and $[-3, -2]$



Objective: Graph a quadratic function using transformations from Vertex Form.

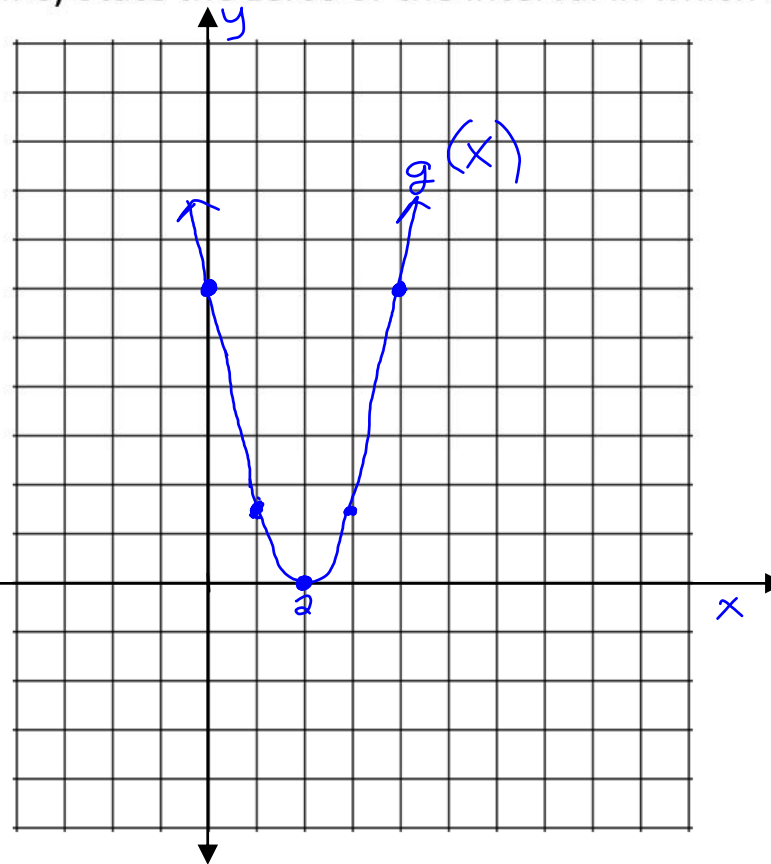
Ex) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

$$g(x) = \frac{3}{2}(x - 2)^2$$

$a = \frac{3}{2}$ $h = 2$
 stretch right
 $\frac{3}{2} = 1\frac{1}{2}$ 2

(B) vertex (2,0)
 minimum

(C) zero = 2



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Ex) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

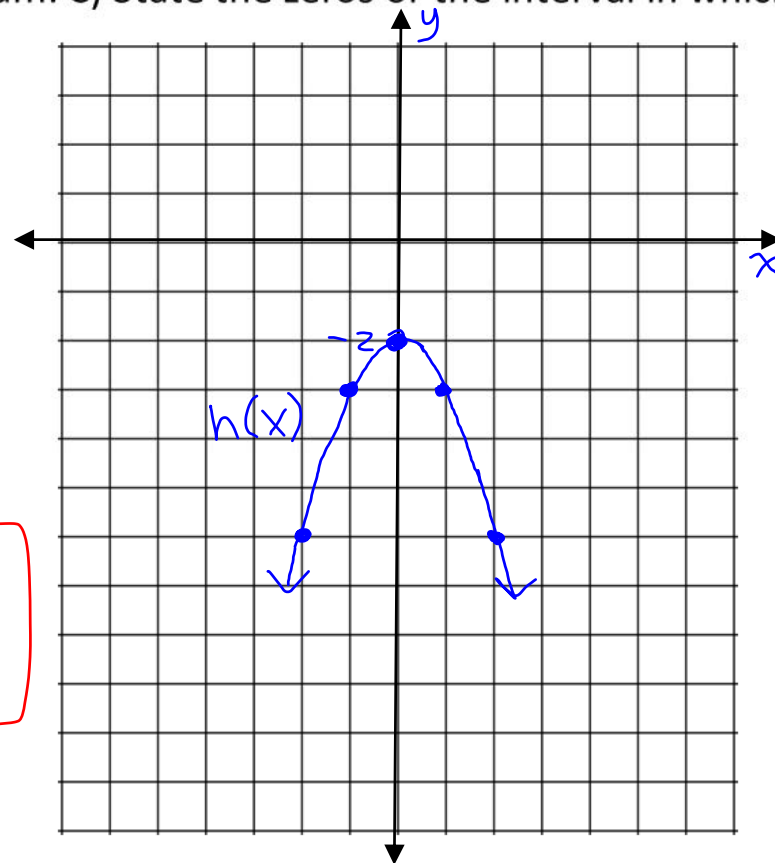
$$h(x) = -x^2 - 2$$

$$h(x) = -1x^2 - 2$$

$a = -1$ $k = -2$
 x-axis refl. down 2

B) vertex $(0, -2)$
 maximum

C) There are no zeros.



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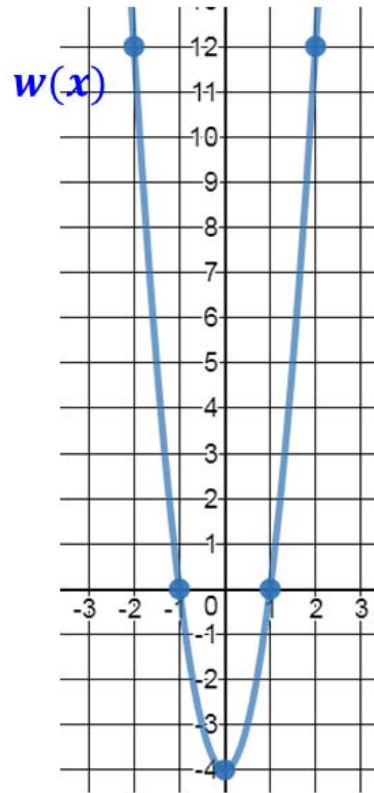
Practice) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

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

B) Vertex

$(0, -4)$; minimum

C) The zeros are $x = -1$
and $x = 1$.



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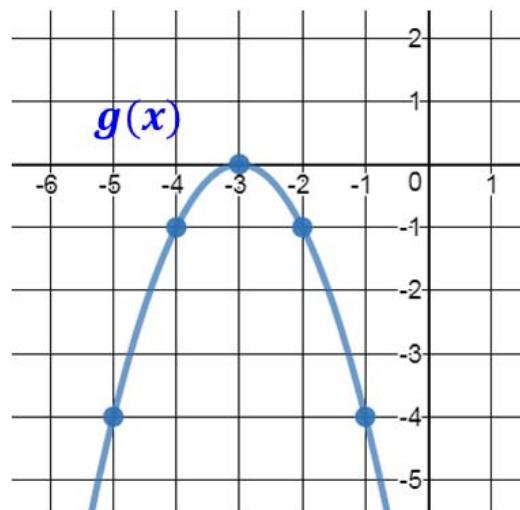
Practice) A) Graph each quadratic function using transformations. B) State the vertex and whether it's a maximum or minimum. C) State the zeros or the interval in which a zero is located.

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

B) Vertex

$(-3, 0)$; maximum

C) The zeros is $x = -3$.



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Closure

Write the quadratic function in the form $f(x) = a(x - h)^2 + k$ that represents the graph of the parabola.

$$f(x) = 2(x - 1)^2 - 6$$

