

4-7A Analyzing Graphs of Quadratic Functions

- Write quadratic functions in $y = a(x - h)^2 + k$
- transform graphs of functions into the equation $y = a(x - h)^2 + k$
- F.IF.8a, F.BF.3

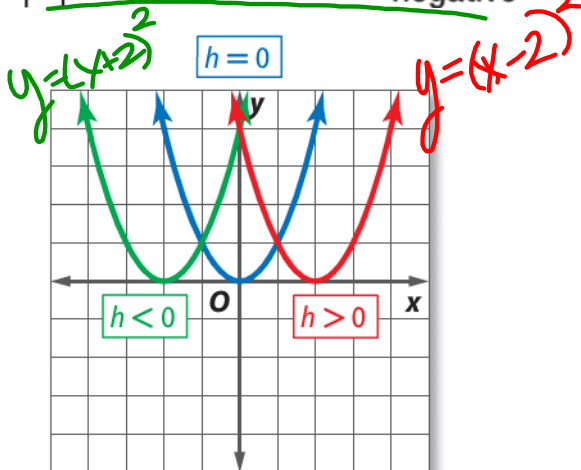
$V(h, k)$

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

h, Horizontal Translation

h units to the right if h is positive

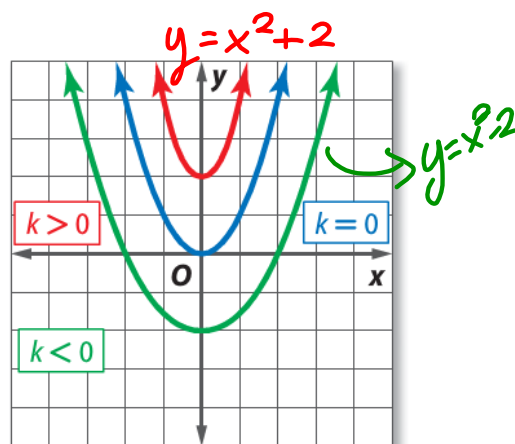
$|h|$ units to the left if h is negative



k, Vertical Translation

k units up if k is positive

$|k|$ units down if k is negative

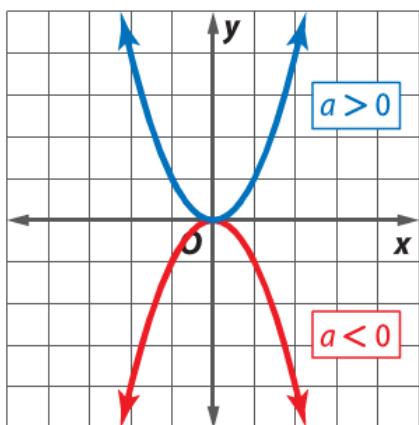


Vertex Form: $y = a(x - h)^2 + k$

a, Reflection

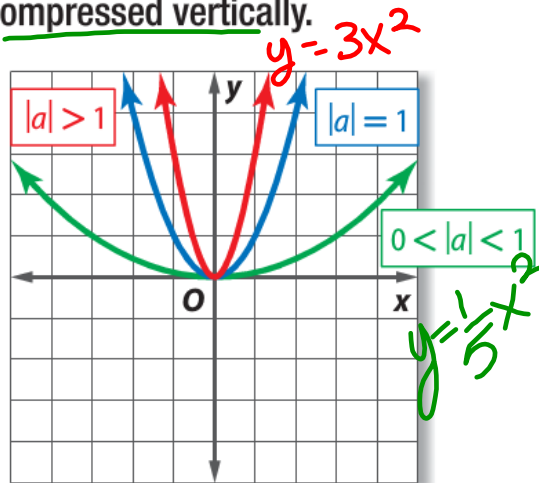
If $a > 0$, the graph opens up.

If $a < 0$, the graph opens down.



a, Dilation

If $|a| > 1$, the graph is stretched vertically. If $0 < |a| < 1$, the graph is compressed vertically.



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

vertex: (h, k)

axis of symmetry: $x = h$

$$y = ax^2 + bx + c$$

$$V\left(-\frac{b}{2a}, -\right)$$

axis of Sym: $x = -\frac{b}{2a}$

$$y = mt + (0, c)$$

Describe the following functions in terms of position, direction of opening, and width compared to its parent function.



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

$$V(-1, -3)$$

$$x = -1$$

reflection over the
y-axis stretch vertically

2. $y = .9(x - 3)^2 + 0$

$$(3, 0)$$

3. $f(x) = -0.5x^2 - 1$

$$-\frac{1}{2}(x-0)^2 - 1$$

$$V(0, -1)$$

4. $y = -x^2$

Write the following functions in vertex form, then analyze the function.

1. $y = x^2 + 8x - 5$ $y = a(x-h)^2 + k$ $\frac{8}{2} = -4 \Rightarrow (-4)^2 = 16$

$y + 5 + 16 = x^2 + 8x + 16$ $V(-4, -21)$

$y + 21 = (x + 4)^2 - 21$

$y = (x + 4)^2 - 21$

axis of sym: $x = -4$
no dilation
no ref. y -int $(0, -5)$

Write the following functions in vertex form, then analyze the function.

2. $y = \frac{-3x^2 + 6x - 1}{-3}$

$(\frac{b}{2a})^2$

$\frac{y}{-3} = x^2 - 2x + \frac{1}{3}$

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

$3 \left(\frac{y}{-3} + \frac{2}{3} \right) = 3(x-1)^2$

$V(1, 2)$

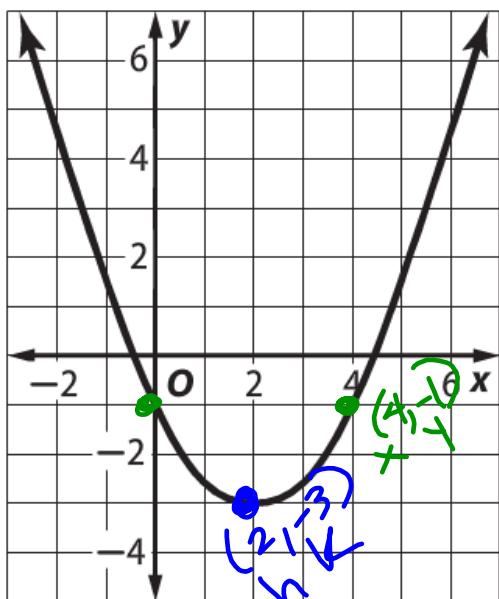
$y - 2 = -3(x-1)^2$

$x = 1$

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

reflection over the x -axis
stretched vertically
 y -int $(0, 1)$

3. Write an equation for the quadratic function graphed below.



$$y = a(x-h)^2 + k$$
$$-1 = a(4-2)^2 - 3$$
$$-1 = a(2)^2 - 3$$
$$-1 = 4a - 3$$
$$2 = \frac{4a}{4}$$
$$\frac{1}{2} = a$$

$a: +\frac{1}{2}$
 $h: 2$
 $k: -3$

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

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9-19 odd, 35-39 odd



Write each function in vertex form.

8. $y = x^2 + 9x + 8$

9. $y = x^2 - 6x + 3$

10. $y = -2x^2 + 5x$

11. $y = x^2 + 2x + 7$

12. $y = -3x^2 + 12x - 10$

13. $y = x^2 + 8x + 16$

14. $y = 2x^2 - 4x - 3$

15. $y = 3x^2 + 10x$

16. $y = x^2 - 4x + 9$

17. $y = -4x^2 - 24x - 15$

18. $y = x^2 - 12x + 36$

19. $y = -x^2 - 4x - 1$

Write an equation in vertex form for each parabola.

