

Algebra 2 4.7

Write a quadratic function in vertex form

Transform quadratic functions

$$ax^2 + bx + c = 0$$

quadratic

vertex

completing the square

vertex form

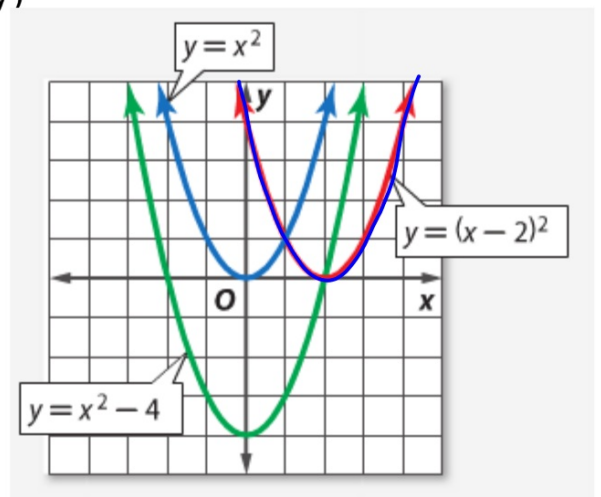
parent graph

transformation (Ch. 2.7, also geometry)

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

transl.

refl.

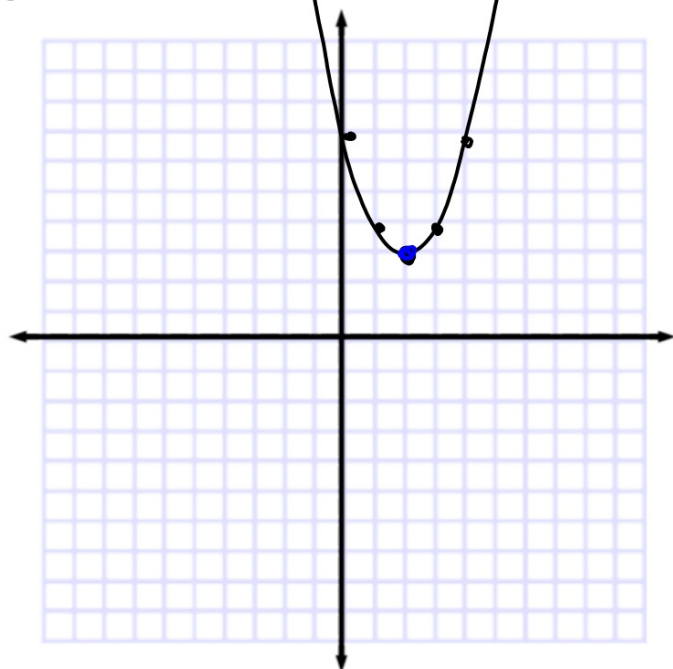


parent graph $y=x^2$

2 right
up 3

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

↑ ↑
h k



Example 1 Write Functions in Vertex Form

Write each function in vertex form.

a. $y = x^2 + 6x - 5$

$$\begin{array}{l} \text{+5} \qquad \qquad \text{+5} \\ y+5 = x^2 + 6x + 9 \\ \text{+9} \\ y+14 = (x+3)^2 \\ \text{-14} \end{array}$$

$$y = \underline{(x+3)^2} - 14 \quad V(-3, -14)$$

CTS
(move c)

Guided Practice

$$1A. y = x^2 + 4x + 6$$

$-6 \qquad -6$

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

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

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

$$1B. \quad y = 2x^2 - 12x + 17$$

-17
 -17

$$y - 17 = 2(x^2 - 6x + 9)$$

$+18$

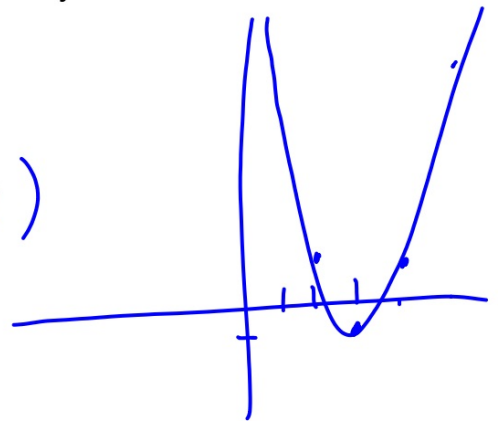
$$y + 1 = 2(x - 3)^2 - 1$$

-1

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

1. Move c
2. GCF *factor*
3. CTS from inside () instead of $\div$ *dist. prop*
4. Solve for y

$$\sqrt{(3, -1)}$$



$$\text{b. } y = -2x^2 + 8x - 3$$

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

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

Move c
GCF
CTS
Solve for y

compare to parent graph

Standardized Test Example 2 Write an Equation Given a Graph

Which is an equation of the function shown in the graph?

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

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

~~C $y = \frac{1}{4}(x + 3)^2 - 2$~~

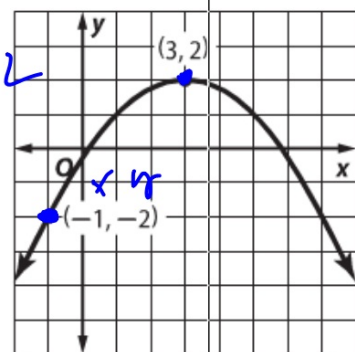
~~D $y = -4(x + 3)^2 - 2$~~

$(x - 3)^2 + 2$

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

$-2 = -\frac{1}{4}(-4)^2 + 2$

$-2 = -\frac{1}{4}(16) + 2$



which equation works with (x,y)?

compare to parent graph

Guided Practice

2. Which is an equation of the function shown in the graph?

E $y = \frac{9}{25}(x - 1)^2 + 2$

G $y = \frac{3}{5}(x + 1)^2 - 2$

H $y = \frac{5}{3}(x + 1)^2 - 2$

J $y = \frac{25}{9}(x - 1)^2 + 2$

$$13 = \frac{3}{5}(-4 + 1)^2 - 2$$

$$13 = \frac{3}{5}(-7)^2 - 2$$

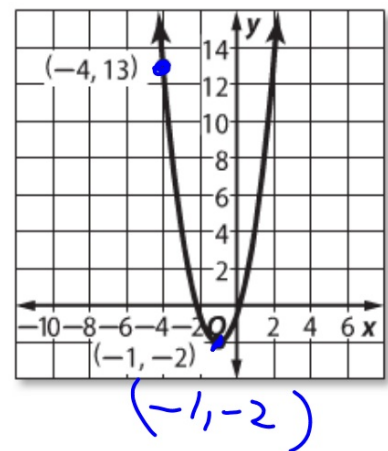
$$13 = \frac{5}{3}(-4 + 1)^2 - 2$$

$$13 = \frac{25}{9}(-3)^2 - 2$$

$$13 = -\frac{15}{7} - 2 = -5$$

$$13 = \frac{5}{3}(9) - 2$$

✓✓✓ $13 = 15 - 2$



Which one works with (x,y)?

From Ch. 2.7... $-\frac{b}{2a}$

ConceptSummary Transformations of Quadratic Functions

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

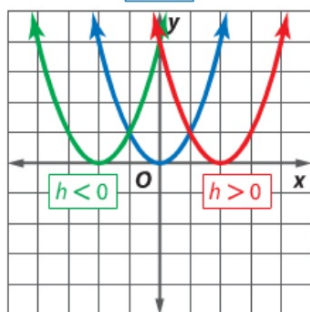
h, Horizontal Translation

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

$$h = 0$$

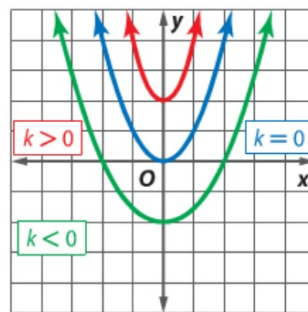
$$x - h$$

$$x - -h$$



k, Vertical Translation

k units up if k is positive
 $|k|$ units down if k is negative



$$x - 3$$

$$x + 3$$

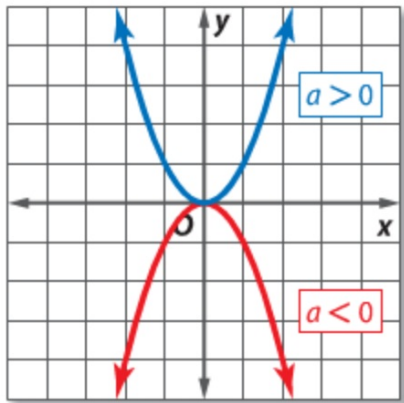
$$x - -3$$

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

a, Reflection

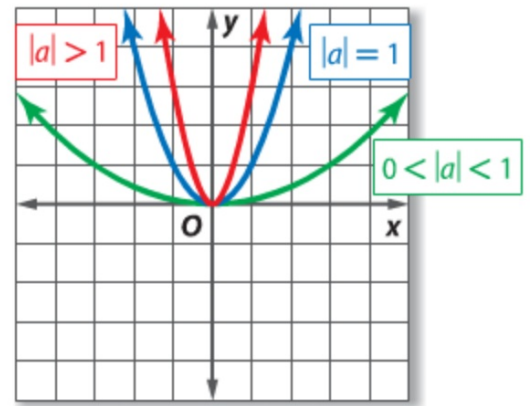
If $a > 0$, the graph opens up.

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.

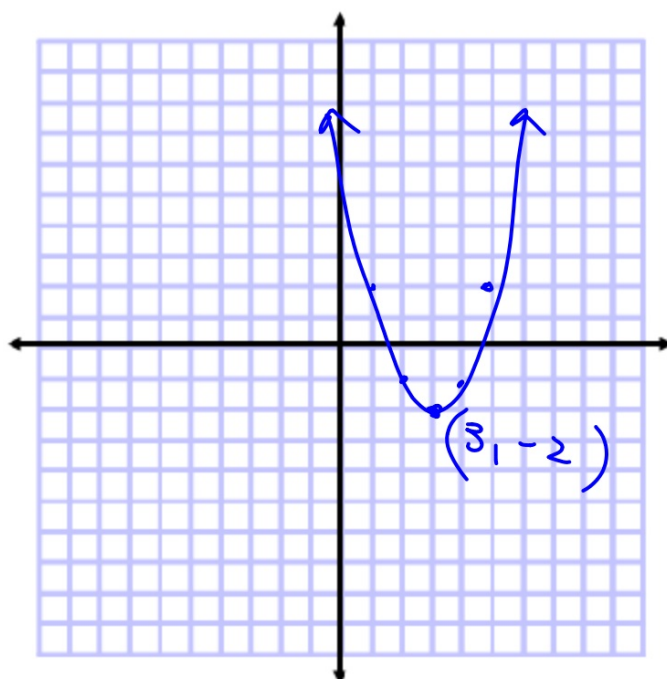
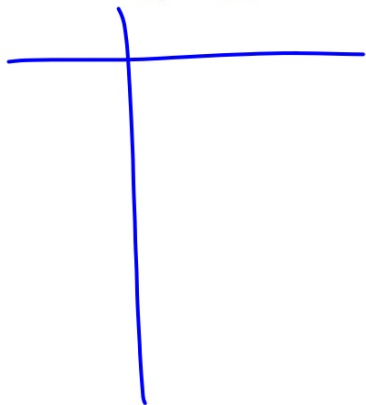


Graph (parent graph)

GuidedPractice

3A. $y = (x - 3)^2 - 2$

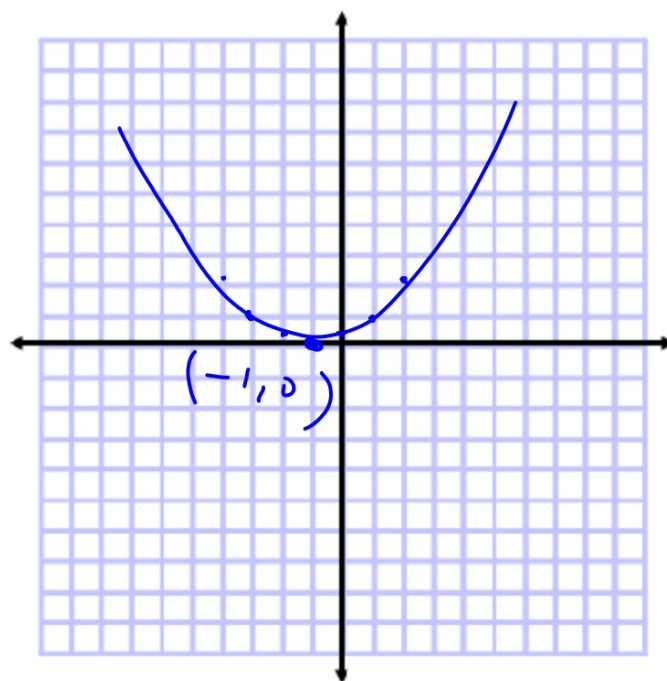
$x = -3$



3B. $y = 0.25(x + 1)^2 + 0$

$\frac{1}{4}$

In terms of the parent graph



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