Algebra 2 4.7

Write a quadratic function in vertex form

Transform quadratic functions

quadratic

vertex

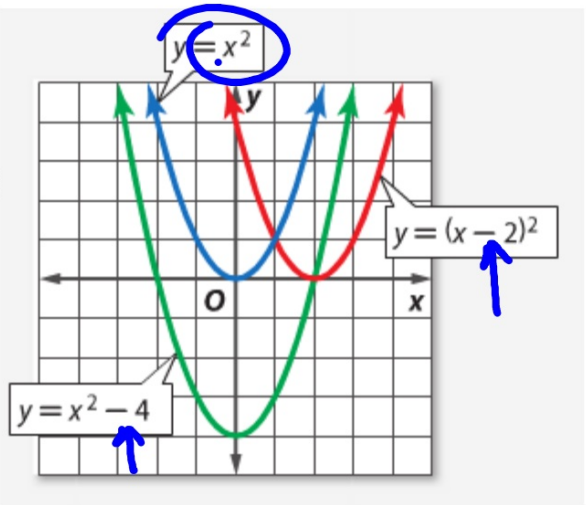
completing the square

vertex form

parent graph

transformation (Ch. 2.7, also geometry)

where is new vertex?

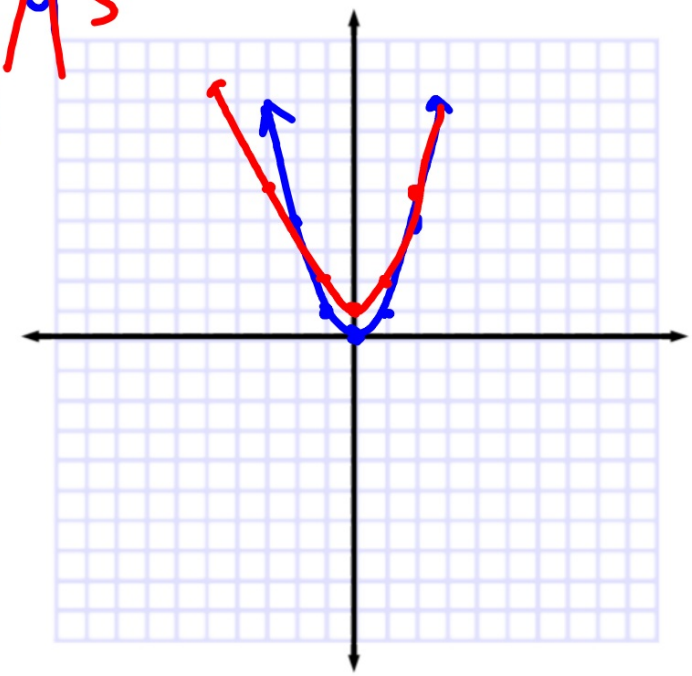


$(\quad)^2 + ?$

x y

parent graph $y=x^2$ +1

x	y
0	0 + 1 = 1
1	1 + 1 = 2
2	4 + 1 = 5



Example 1 Write Functions in Vertex Form

CTS
(move c)

Write each function in vertex form.

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

+5 +5

$y + 5 = x^2 + 6x + 9$

$y + 14 = (x+3)^2$

$-14 \quad -14$

$y = (x+3)^2 - 14$

opp. Same

$V(-3, -14)$

GuidedPractice

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

$-6 \quad -6$

$y = (\quad)^2 \pm$

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

$+4$

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

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

$+2$

$V(-2, 2)$

1. Move c
2. GCF
3. CTS from inside ( ) instead of ÷
   ~~Solve for y~~
4. Distr.
5. Solve for y

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

$-17 \qquad -17$

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

$+18$

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

$-1 \qquad -1$

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

$V(3, -1)$

b. $y = -2x^2 + 8x - 3$

$+3 \quad -2 \quad -2 \quad +3$

Move c
GCF
CTS
Solve for y

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

-8

$y - 5 = -2(x-2)^2 \qquad V(2,5)$

$+5 \qquad +5$

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

compare to parent graph

Standardized Test Example 2 Write an Equation Given a Graph

PT

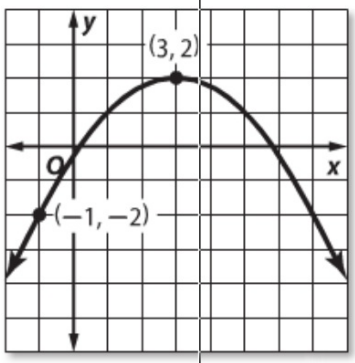
Which is an equation of the function shown in the graph?

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



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

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

$-2 = a(-4)^2 + 2$

$-2 = 16a + 2$

$-2 \quad -2$

$\frac{-4}{16} = \frac{16a}{16}$

which equation works with (x,y)?

compare to parent graph

GuidedPractice

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

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

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

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

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

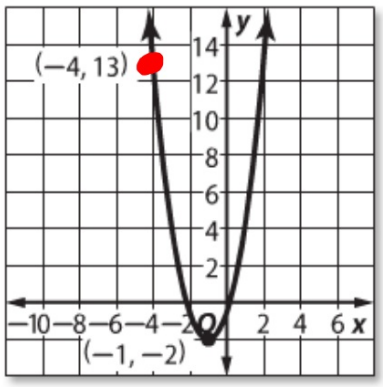
$13 = a(-4+1)^2 - 2$

$13 = a(-3)^2 - 2$

$13 = 9a - 2$

$+2 \quad +2$

$\frac{15}{9} = \frac{9a}{9}$



Which one works with (x,y)?

From Ch. 2.7...

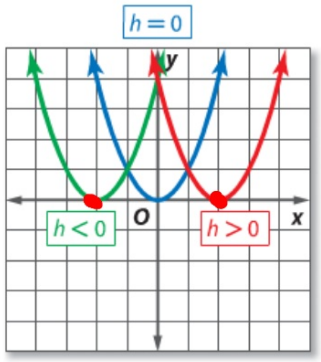
ConceptSummary Transformations of Quadratic Functions

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

h, Horizontal Translation

h units to the right if h is positive

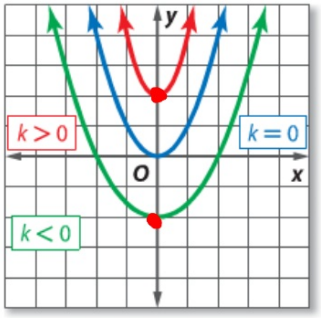
$|h|$ units to the left if h is negative



k, Vertical Translation

k units up if k is positive

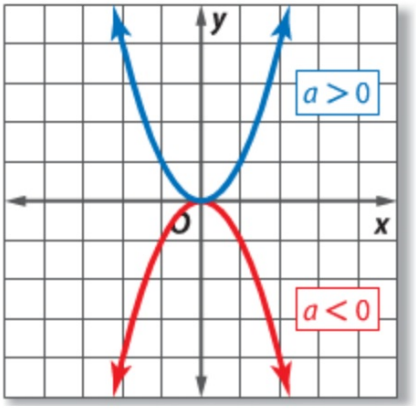
$|k|$ units down if k is negative



a, Reflection

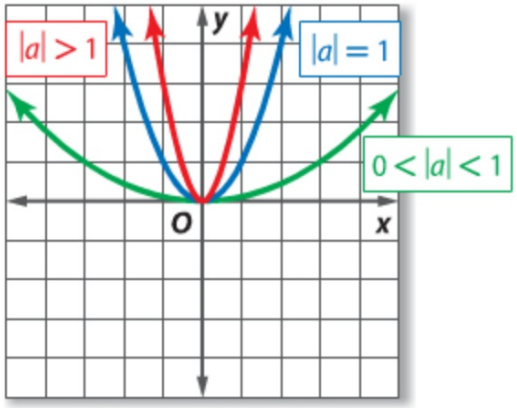
If $a > 0$, the graph opens up.

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.



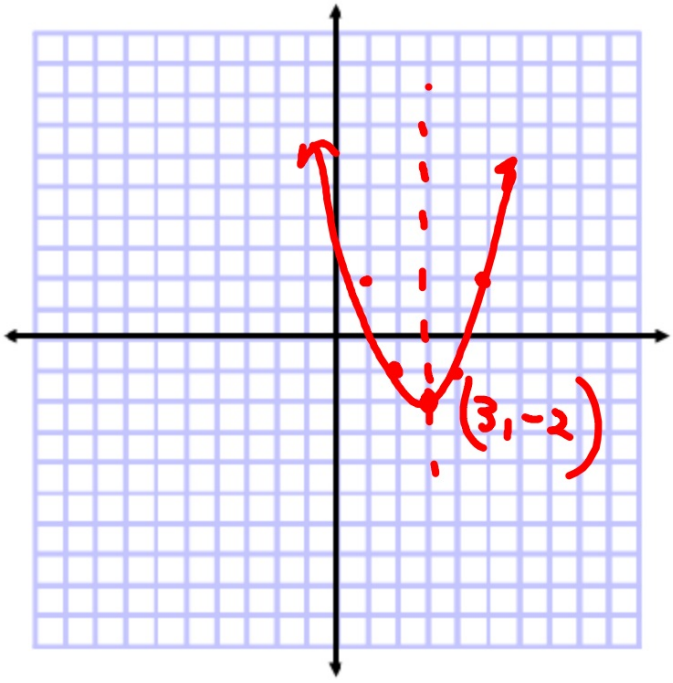
Graph (parent graph)

GuidedPractice

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

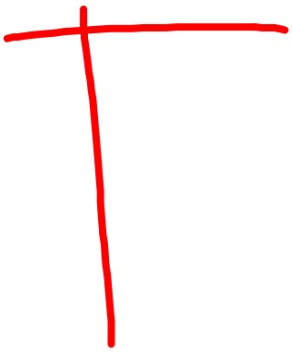
V (3, -2)

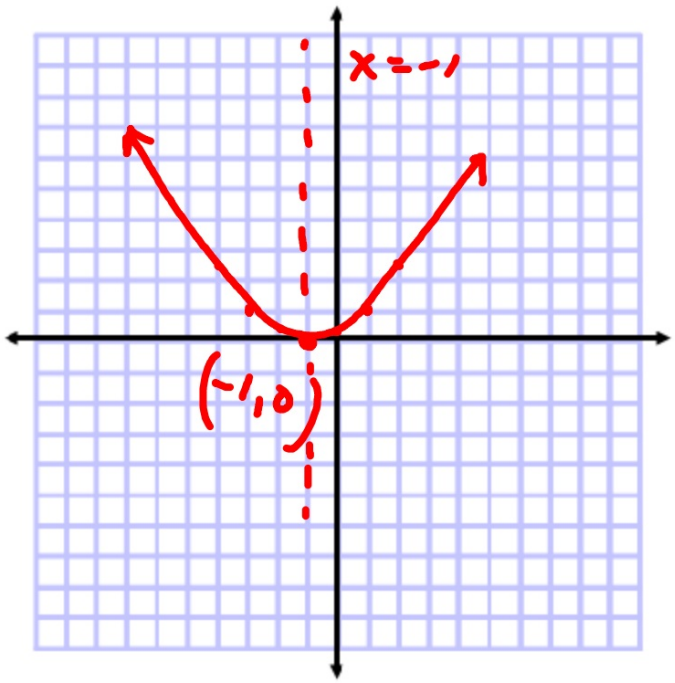
x	y
x - 3	
x - 3	
x^2	



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

In terms of the parent graph





4.1
9-45 odd

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

$V(-4, -3)$

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

$+16$

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

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