## Remember, the vertex is either the maximum or the minimum of a quadratic function.

The max/min value of a quadratic function is.....the y-coordinate of the vertex

When a max/min of a quadratic occurs is.....the x-coordinate of the vertex

A ball is shot into the air with an initial velocity of 80 ft/sec from the top of a 50 ft tall building. The following equation models the height (ft) of the object as a function of time (sec).

$h(t) = -16t^2 + 80t + 50$

LOS: $x = \frac{-80}{-32} = 2.5$

$(t, h) = (2.5, 150)$

The maximum is the VERTEX

1. Find the time it takes the object to reach its maximum height.

2.5 sec

2. Find the maximim height of the object. 150 ft

For each quadratic find the following:
a. The equation of the LOS
b. The coordinates of the vertex
c. The y-intercept.

1. $y = -3x^2 + 12x - 5$

a. LOS: $\frac{-12}{-6}$ $x = 2$

b. Vertex: $(2, 7)$

c. y-int $-5$

2. $y = 4(x + 6)^2 - 11$

a. LOS: $x = -6$

b. Vertex: $(-6, -11)$

c. y-int 133

$4(36) - 11$

$(0+6)^2$

$144 - 11$

replace x with zero and simplify.

For each quadratic find the following:
a. The equation of the LOS
b. The coordinates of the vertex
c. The y-intercept.

3. $y = 7x^2 - 8$ $b = 0$

a. LOS: $x = 0$

b. Vertex: $(0, -8)$

c. y-int $-8$

4. $y = -2x^2 + 8x$ $c = 0$

a. LOS: $x = \frac{-8}{-4} = 2$

b. Vertex: $(2, 8)$

c. y-int $0$

In general, if the function $y = f(x)$ is transformed the following way:

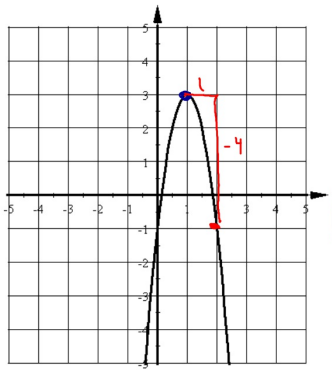
$$y = a\, f(x - h) + k$$

The parent function has been:

- Streched/Shrunk vertically by a factor of a
- Reflected over x-axis if a<0
- Translated horizontally h units.
- Translated vertically k units.

Write the equation of this parabola in Vertex Form.

1.



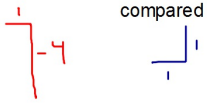

1 right, 3 up

Vertex (1, 3)

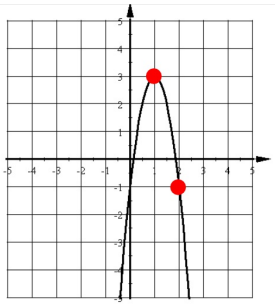
$y = a(x - 1)^2 + 3$

$y = -4(x-1)^2 + 3$

compared to the parent function




This shows that this graph is 4 times taller but upside down compared to the parent function: a = -4



Another way to find a:

Using the vertex of (1,3) you can get this much of the equation:

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

Use the coordinates of ANY other point on the graph: If you pick (2, -1)

replace x with 2 and y with -1 then solve for a. → $-1 = a(2 - 1)^2 + 3$

$(1)^2$

$a \cdot 1$

$-1 = a + 3$

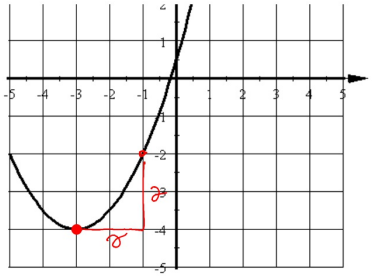
$-3 \quad -3$

$-4 = a$

The eq is: $y = -4(x - 1)^2 + 3$

Write the equation of this parabola in Vertex Form.

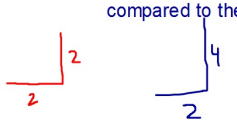
2.



Vertex: (-3, -4)

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

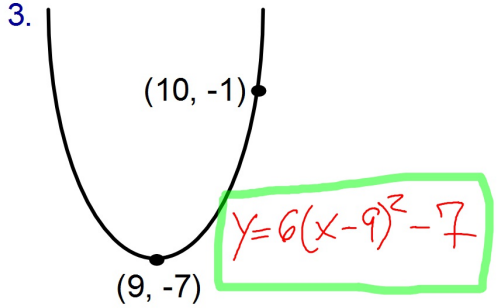
compared to the parent function




this shows that this graph is half as tall as the parent function: a = 1/2

## Write the equation of this parabola in Vertex Form.

3.




$y = 6(x-9)^2 - 7$

9 right ↓ 7 down ↓

$y = a(x-9)^2 - 7$

$-1 = a(10-9)^2 - 7$

$-1 = a(1) - 7$

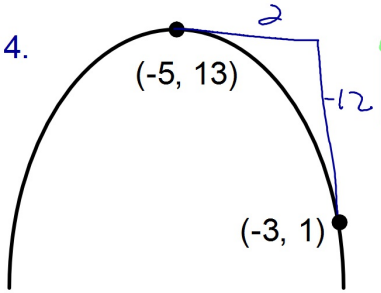
$-1 = a - 7$

$+7 \quad +7$

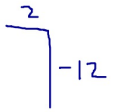
$6 = a$

## Write the equation of this parabola.

4.




$y = -3(x+5)^2 + 13$




Compared to the parent function:


This shows that this graph is three times taller and upside down: a = -3