Chapter 5: Quadratic Equations and Functions

Quadratic Function:
    A function whose graph is a Parabola.
   A function whose largest exponent is 2.

Characteristics of a Parabola:

- It can open up or down.

  Opens UP   Opens DOWN

- It has a Vertex which is the
  lowest point when the parabola opens UP
  highest point when the parabola opens DOWN

- It has reflective symmetry over the Line of Symmetry (LOS)
  which is a vertical line passing through the Vertex

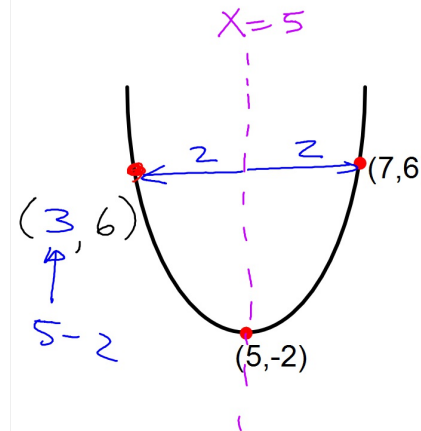- All parabolas have either a Maximum or a Minimum value.

(-2,3)
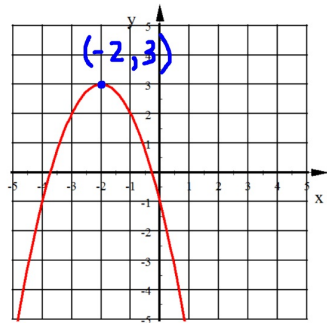
What is the Maximum value of this quadratic?   3

The value of a function is what y equals.

When does the Max occur? $X = -2$

When something occurs on a graph is what x equals.

$X = 5$

2 2 (7,6)

(3,6)

5 - 2

(5,-2)

State the coordinates of another point on this parabola.

The LOS must be x = 5 because it is the vertical line passing through the origin. You can reflect the point (7,6) over this LOS to find another point.

When reflecting over the LOS the y-coordinate won't change. To find the x-coordinate find the distance from the given point to the LOS and then move that same distance on the other side of the LOS to get the new x-coordinate.

Panel 1
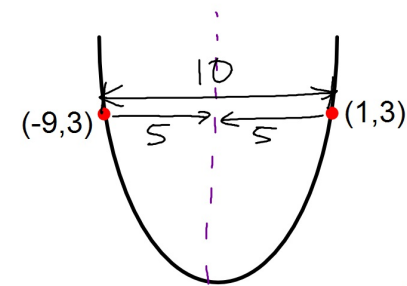
State the equation of the LOS.

(-9,3) (1,3)

The LOS is exactly in the middle of these two points. You can find the LOS one of two ways.

1. Find the distance between the two given points (10) then divide this by two(5). Starting at either point move this distance(5) toward the middle and find the LOS is x = -4

$$\frac{-9+1}{2} = \frac{-8}{2} = -4$$

2. Since you want the point exactly halfway between the given points all you need to do is average the two x-coordinates and find the LOS is x = -4
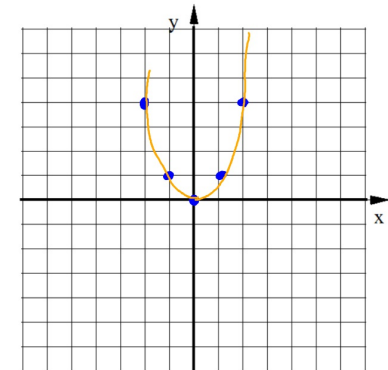
$$X = -4$$

Panel 2

Graph of the Parent Quadratic Function:

$$y = x^2$$

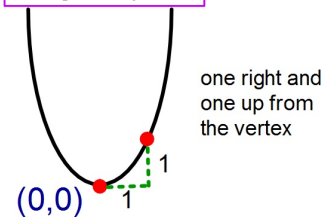| X	Y
-2	4
-1	1
0	0
1	1
2	2

Connect these points with a smooth curve, don't use a ruler!
If you find it hard to connect with a smooth curve that probably means at least one of the points is in the wrong spot.

Panel 3

Do NOT use the word slope when working with Parabolas!

Panel 4

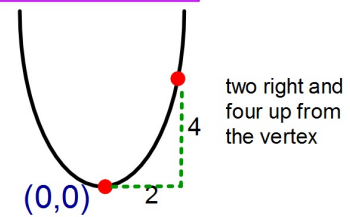### Parent Quadratic Function: $y = x^2$

Graph is a parabola that opens UP.
Vertex is the point (0,0)

1st "good" point:

one right and one up from the vertex

(0,0) 1 1

2nd "good" point:

two right and four up from the vertex

(0,0) 2 4

If you can find the vertex and the first two "good" points on one side you can then use the Line of Symmetry to get points on the other side to complete the parabola.

Transformed Quadratic Function: $y = (x - h)^2 + k$

Graph has Translated:
h Units Horizontally   and   k Units Vertically.

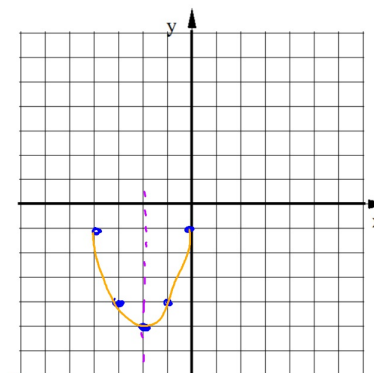$(x - h)^2$ h units RIGHT $(x + h)^2$ h units LEFT

$(x)^2 + k$ k units UP $(x)^2 - k$ k units DOWN

Vertex: (h, k)

Graph the given function using at least five points.

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

2 Left   5 down

Vertex $(-2, -5)$

after you plot the vertex you should notice that
the shape of this parabola is the same as the parent
function. This is because without the horizontal and
vertical translations this equation would simply be $y = x^2$.
Therefore, after the vertex you can use the first two "good" points from the parent function and their
reflections to get the remaining points.