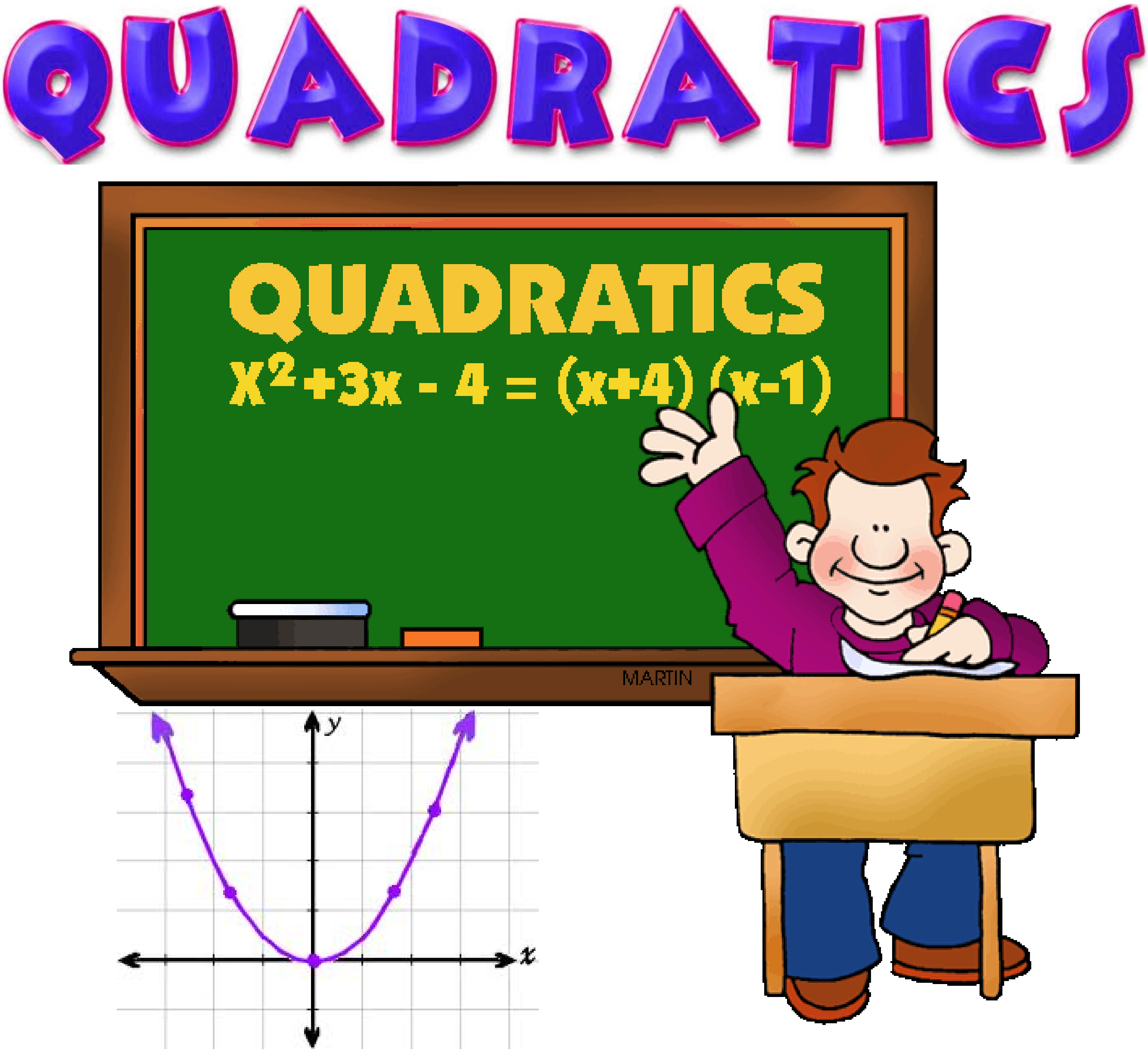
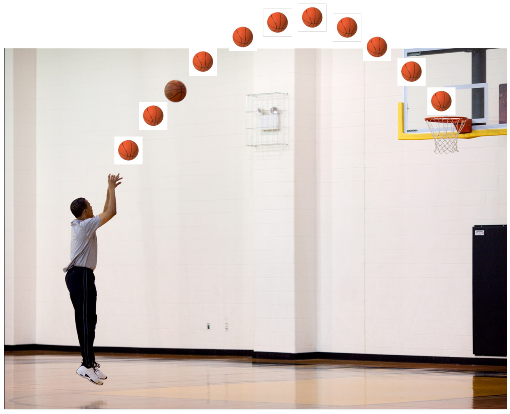
Intro to Vertex Form



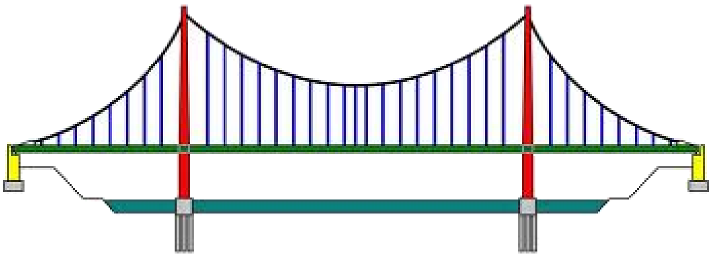
Quadratic functions and their applications can model a large part of the world around us.



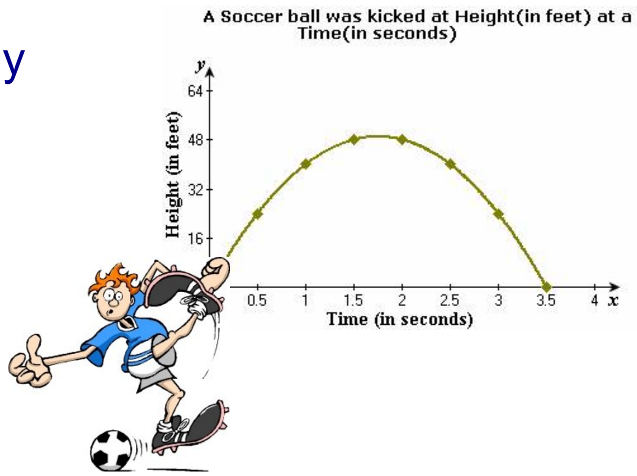
- Consider the path of a basketball after it leaves the shooter's hand.

- Think about how experts determine when and where the explosive shells used in avalanche control will land, as the attempt to make snowy areas safe for everyone.

- Why do satellite dishes and suspension bridges have the particular shapes that they do?



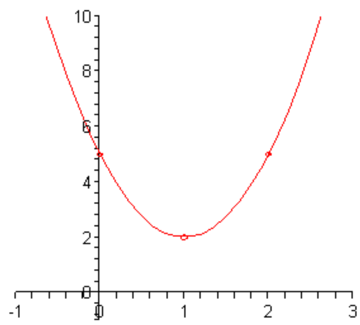
- You can model these and many other everyday situations mathematically with quadratic functions.



Remember ?

from Foundations 11...

- The word "Quadratic" comes from the latin word "Quadratum" which means 'to square'.
- The basic quadratic function is $y = x^2$.
- The graphs of quadratics are *symmetrical* curves called ***parabolas***.



- Parabolas can open up or down and can be wide or narrow; they may cross the x-axis or they may not.

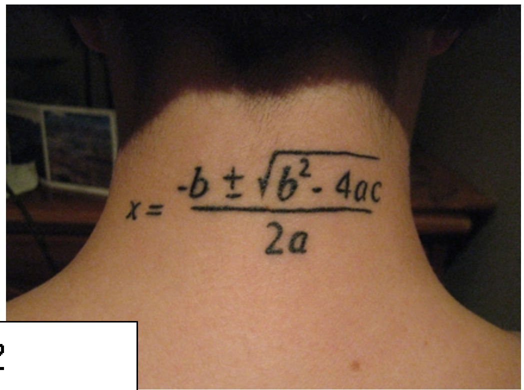
- Quadratic functions may appear in many different forms:
  - a) Standard form... $f(x) = ax^2 + bx + c$
  - b) Factored form... $f(x) = a(x - r)(x - s)$
  - c) Vertex form... $f(x) = a(x - p)^2 + q$

Quadratics may be solved by:

a) graphing

b) factoring

c) using the Quadratic Formula

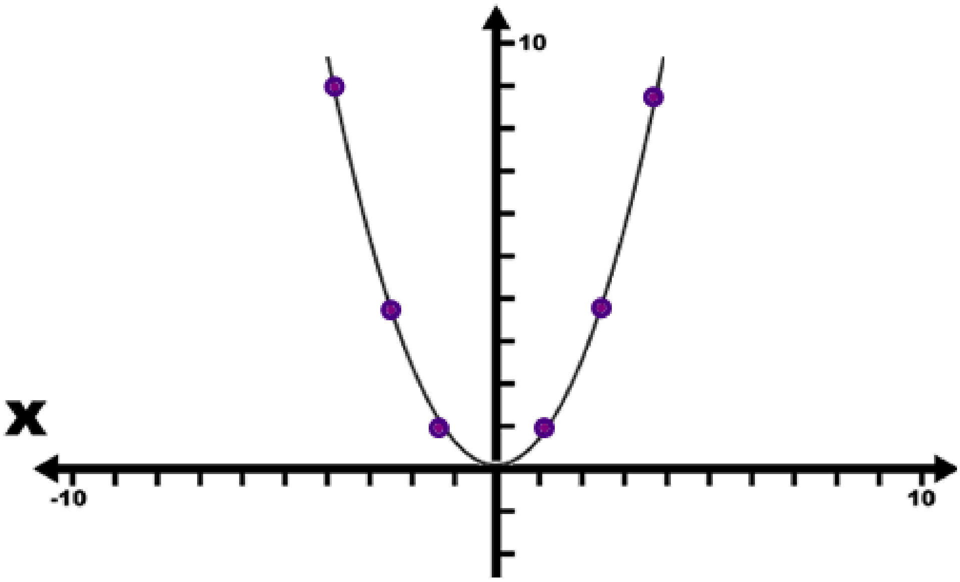


Quadratic expression :	$x^2 + 3x + 2$
Quadratic equation:	$x^2 + 3x + 2 = 0$
Quadratic function :	$f(x) = x^2 + 3x + 2$
Quadratic graph :	$y = x^2 + 3x + 2$
Quadratic inequation:	$x^2 + 3x + 2 < 0$
Quadratic mapping :	$f : x$? $x^2 + 3x + 2$

THE PARABOLA

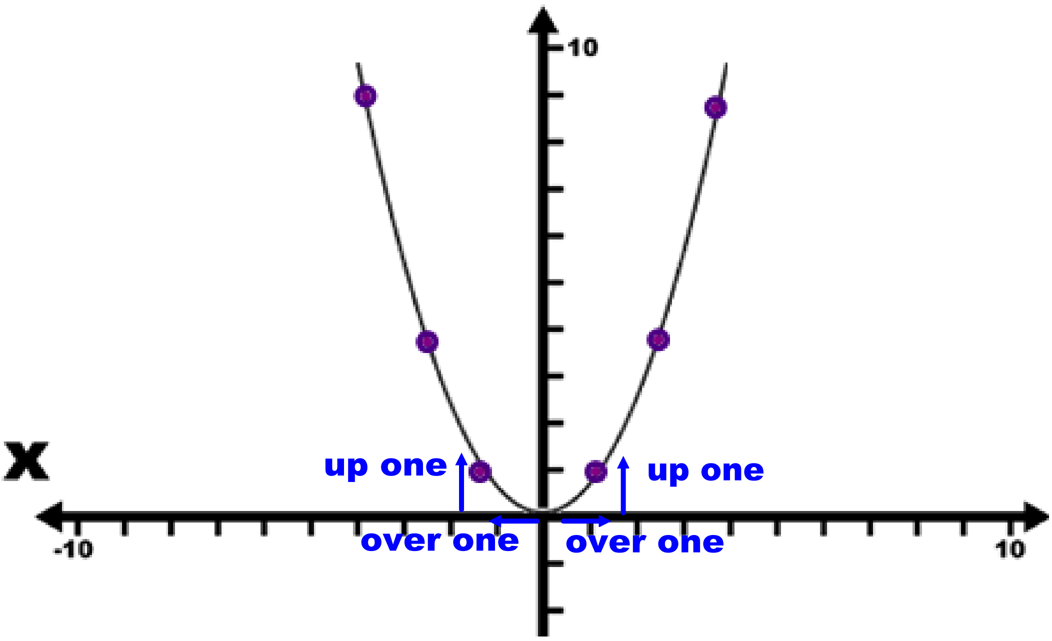
$$y = x^2$$

x	y



THE PARABOLA

$$y = x^2$$



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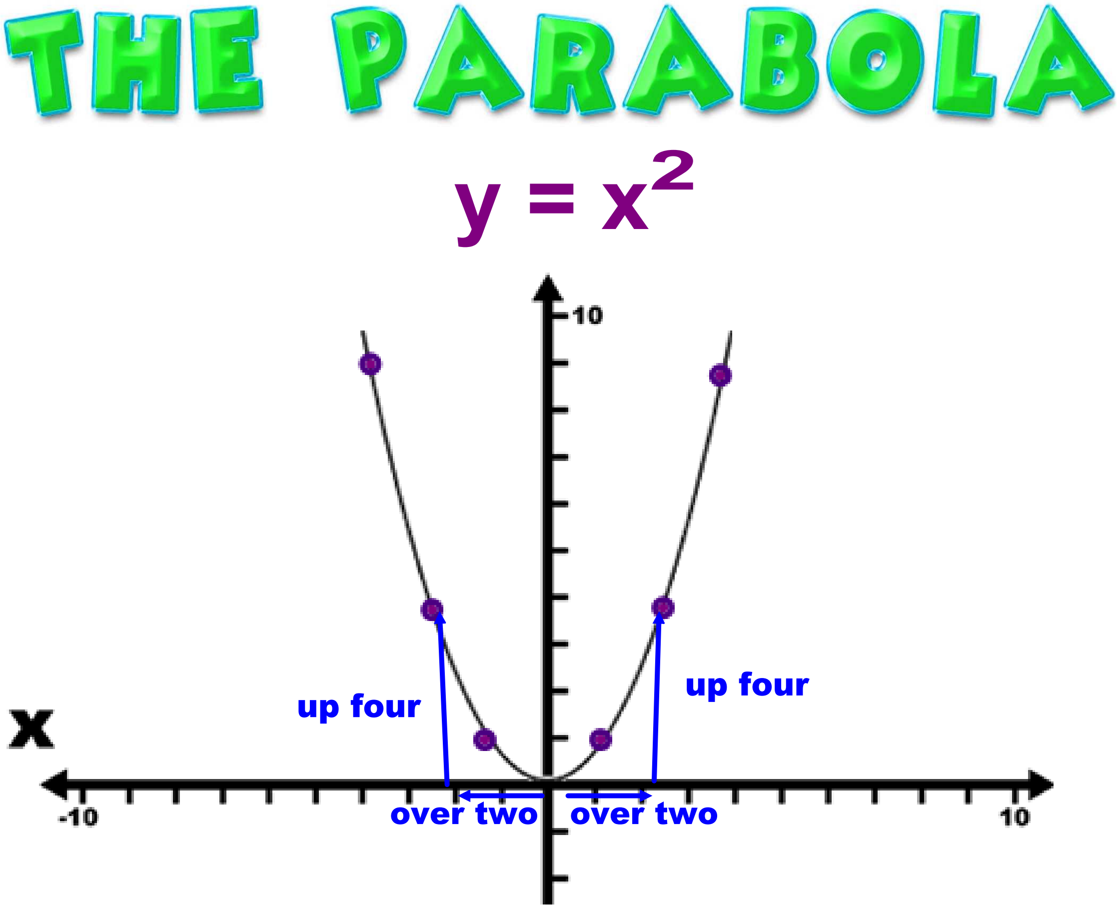
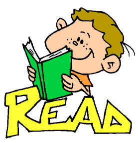


Let's Investigate

Get a graphing calculator.

Turn to Page 143 in your text do the Investigation questions 1 - 9.



Then, read the 'Link the Ideas' on pages 144-145 and record the definitions.

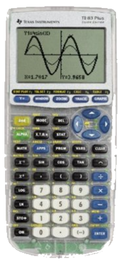
Hint: This is review from Foundations 11

COMPARE

the graphs of f(x) = x^2 and f(x) = ax^2

Graph the following functions on the same set of coordinate axes, with or without technology.

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



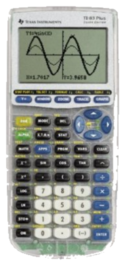
NOW REFLECT & RESPOND

COMPARE

the graphs of $f(x) = x^2$ and $f(x) = x^2 + q$

Graph the following functions on the same set of coordinate axes, with or without technology.

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

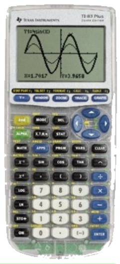


NOW REFLECT & RESPOND

COMPARE

the graphs of $f(x) = x^2$ and $f(x) = (x - p)^2$

Graph the following functions on the same set of coordinate axes, with or without technology.



$f(x) = x^2$

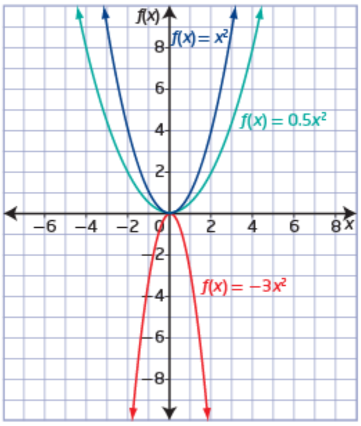
$f(x) = (x - 2)^2$

$f(x) = (x + 1)^2$

NOW REFLECT & RESPOND

What have we learned?

1. The effect of 'a' in $f(x) = ax^2$.



- 'a' determines the orientation
  and width of the parabola

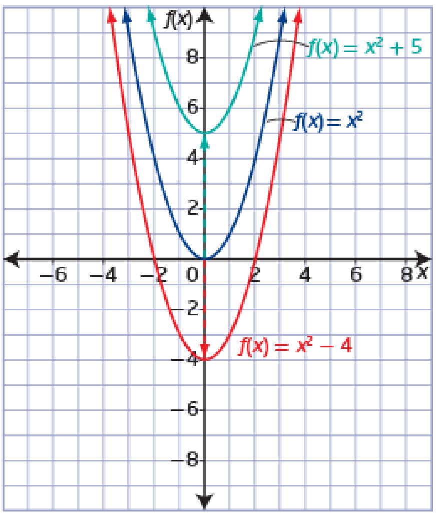
- If a>0, the graph opens upward
  If a<0, the graph opens downward

- If -1<a<1, the graph is wider than $y= x^2$
  If a>1 or a<-1, the graph is narrower than $y= x^2$

2. The effect of 'q' in $f(x) = x^2 + q$

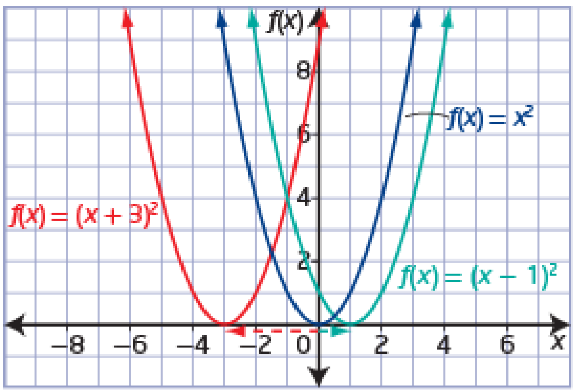
- The parameter 'q' translates the parabola vertically 'q' units.

- The y-coordinate of the parabola's vertex is 'q'.



3. The effect of 'p' in $f(x) = (x - p)^2$.

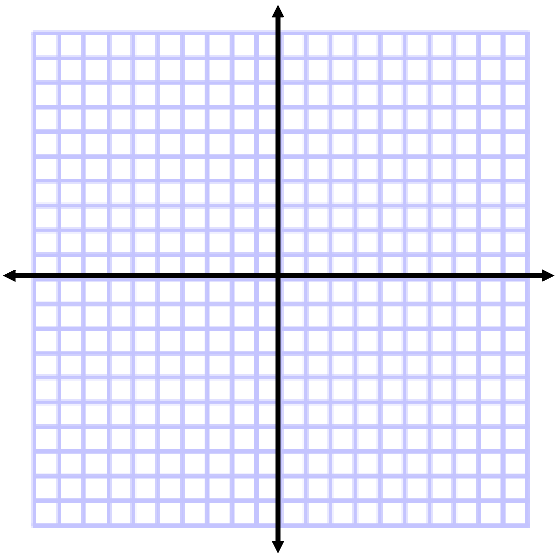
- The parameter 'p' translates the parabola horizontally 'p' units.
- The x-coordinate of the parabola's vertex is 'p'
- The equation of the axis of symmetry is x = p



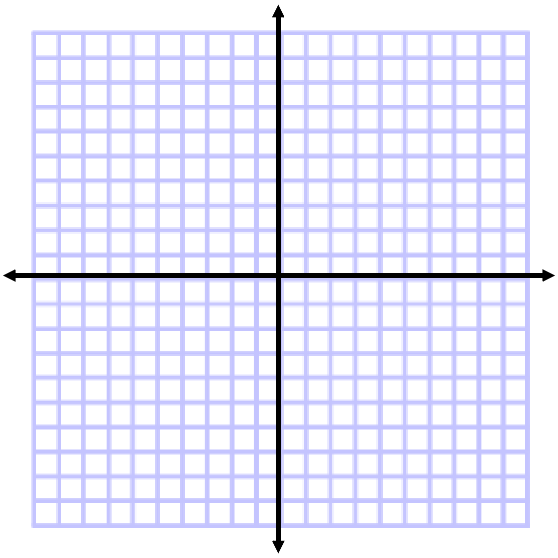
Let's sketch $y = 4(x - 2)^2 - 9$

Example 1: Determine the following characteristics for each function: the vertex; the direction of opening; and the equation of the axis of symmetry Then sketch the graph.

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



b) $y = -1/4\,(x - 4)^2 + 1$

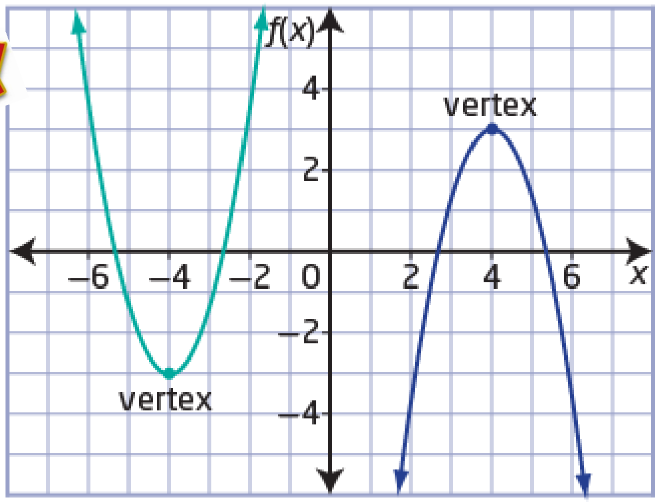


VERTEX FORM

$$y = a(x - p)^2 + q$$

The graph of a quadratic function
is a ***parabola***.

Notice the
SYMMETRY



VERTEX FORM

$$y = a(x - p)^2 + q$$

- Vertex form gives us explicit information about the parabola it represents.

- The axis of symmetry is $x = p$

- The vertex is (p, q)

- The "a" value determines the vertical stretch of the parabola and the direction of opening.

http://www.mathopenref.com/quadvertexexplorer.html

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