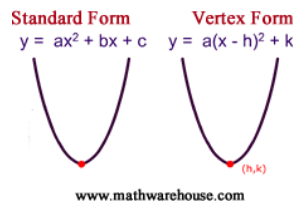
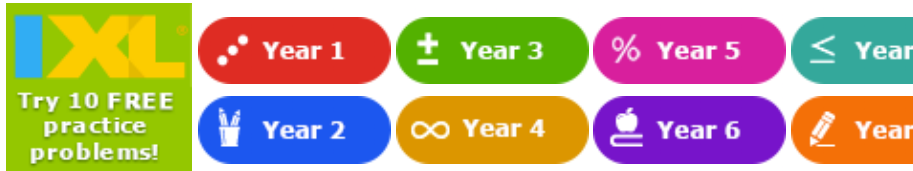




(//www.mathwarehouse.com/)



# Equation of a Parabola

## *Standard Form and Vertex Form Equations*

$$y = \frac{\sqrt{x^2 + 2}}{5 + |$$

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Answer

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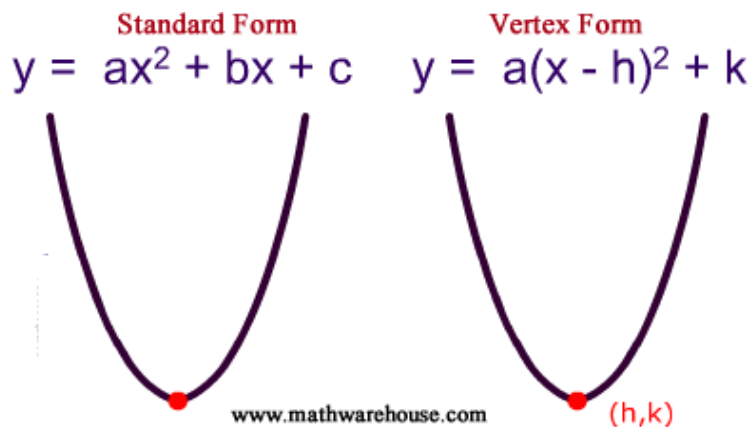
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The equation of a parabola can be expressed in either standard or vertex form as shown in the picture below.



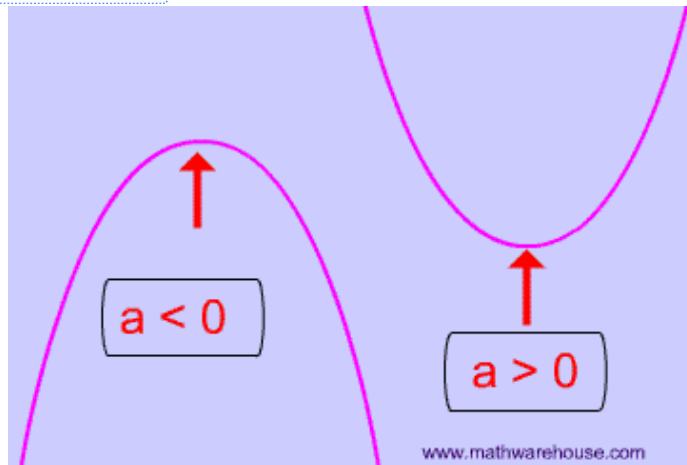
## Standard Form Equation

The standard form of a parabola's equation is generally expressed:

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

## The role of 'a'

- If  $a > 0$ , the parabola opens upwards
- if  $a < 0$  it opens downwards.



## The axis of symmetry

- The axis of symmetry (axis-of-symmetry.php) is the line  $x = -\frac{b}{2a}$

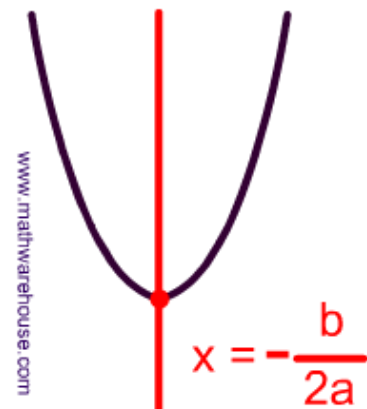
## Picture of Standard form equation

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



## Axis of Symmetry from Standard Form

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



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## Vertex Form of Equation

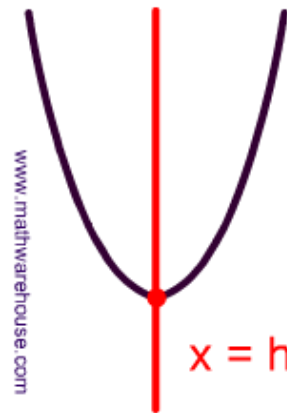
The vertex form of a parabola's equation is generally expressed as:  $y = a(x-h)^2+k$

- (h,k) is the vertex as you can see in the picture below

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



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



- If  $a$  is positive then the parabola opens upwards like a regular "U".
- If  $a$  is negative, then the graph opens downwards like an **upside down** "U".
- If  $|a| < 1$ , the graph of the parabola widens. This just means that the "U" shape of parabola stretches out sideways. Explore the way that 'a' works using our interactive parabola grapher (<https://www.mathwarehouse.com/quadratic/parabola/interactive-parabola.php>).
- If  $|a| > 1$ , the graph of the parabola becomes narrower (The effect is the opposite of  $|a| < 1$ ).

## Practice Problems

### Vertex and Direction-Vertex Form Equation

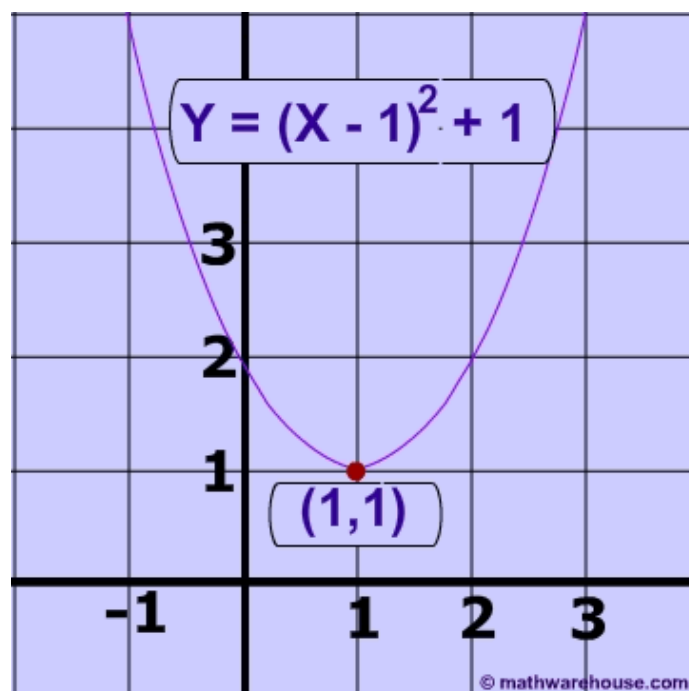
#### Part I

#### Problem 1

What is the graph of the following parabola  $y = (x-1)^2 + 1$ ?

HIDE ANSWER

The parabola's vertex is the point (1,1).




<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem1>

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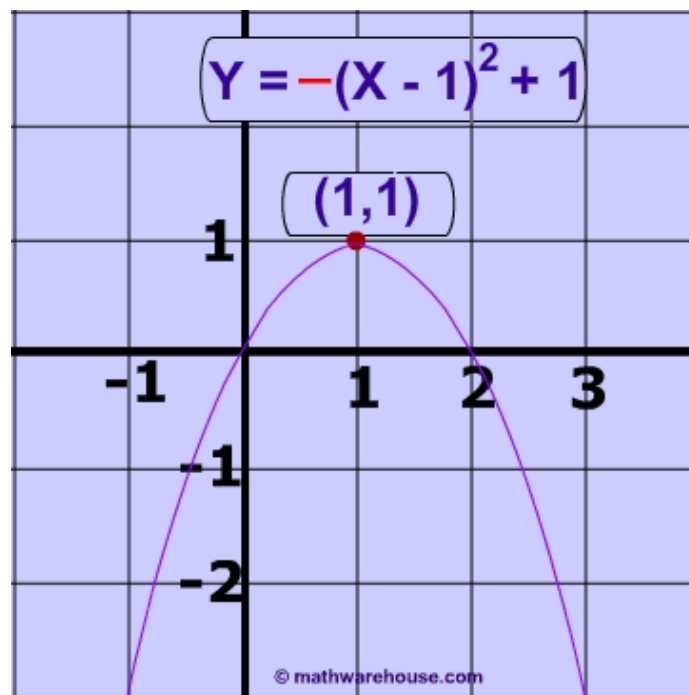


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*Problem 2*

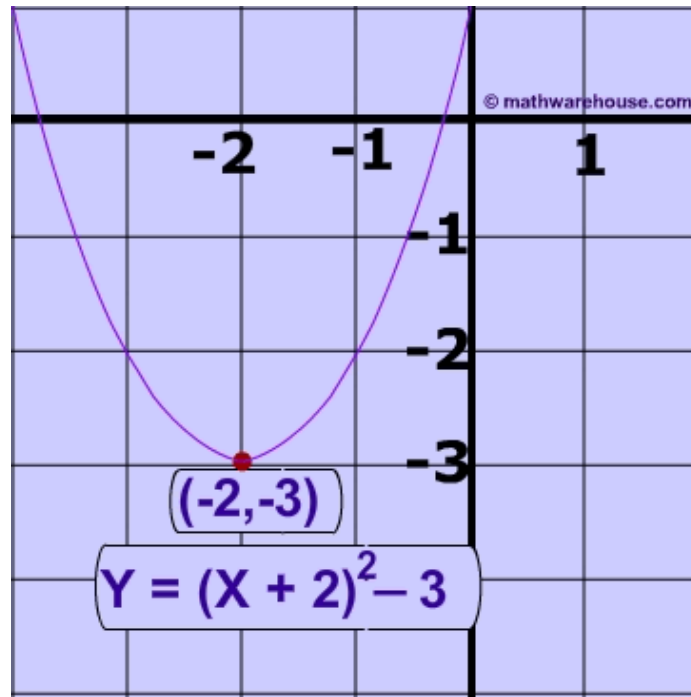
What is the graph of the following parabola  $y = -(x-1)^2 + 1$ ?

HIDE ANSWER


<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem2>
*Problem 3*

What is the graph of the following parabola  $y = (x+2)^2 - 3$ ?

HIDE ANSWER



<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem3>

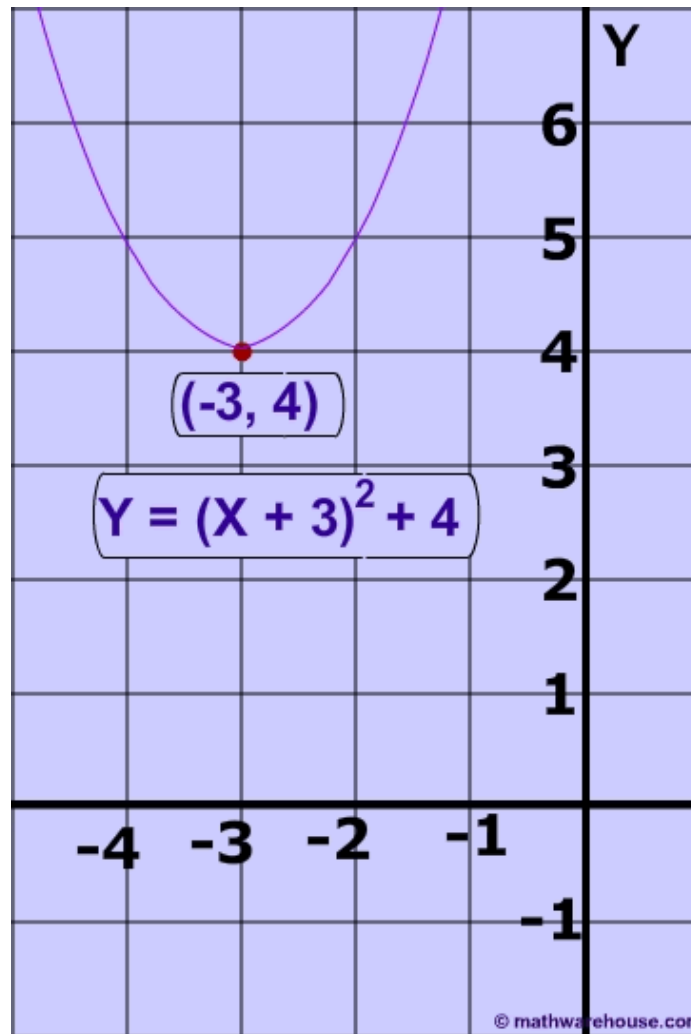
### Identifying the vertex in vertex form

#### ~~Problem 4.1~~

What is the vertex (vertex-of-a-parabola.php) of the following parabola:  $y = (x + 3)^2 + 4$

HIDE ANSWER

The vertex (vertex-of-a-parabola.php) is the point  $(-3, 4)$



<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem4.1>

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### Make Revision Easy

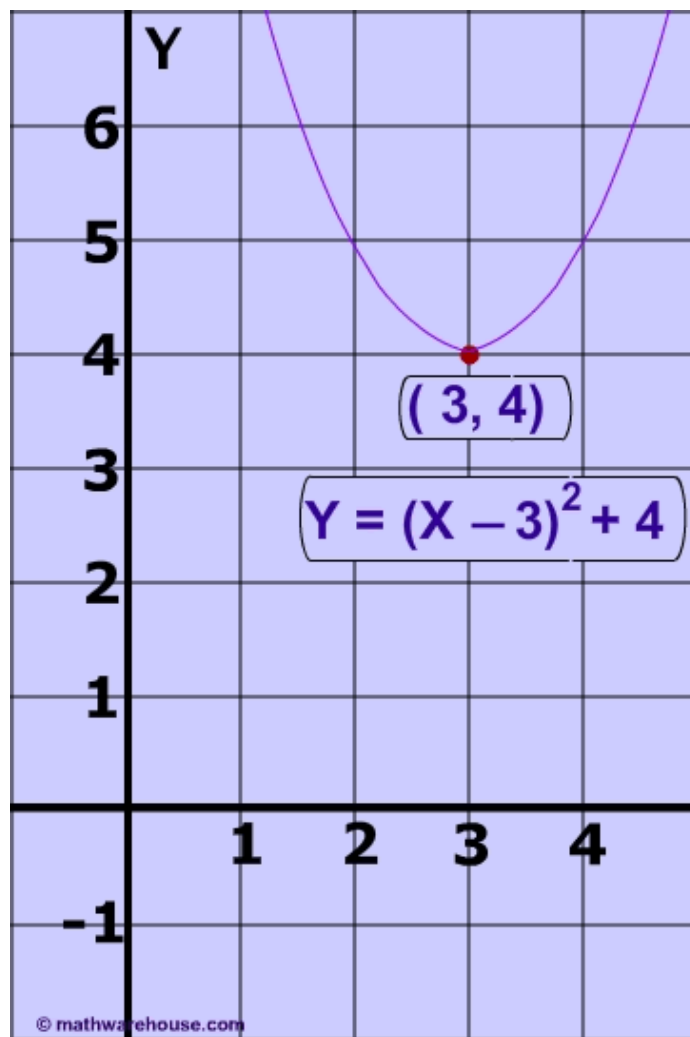
Don't wait until exams. Use Quizlet and study now!

#### Problem 4.2

Find the vertex (vertex-of-a-parabola.php) of the following parabola:  $y = (x - 3)^2 + 4$

HIDE ANSWER

(3,4) is the vertex (vertex-of-a-parabola.php).



<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem4.2>

### Problem 4.3

What is the vertex (vertex-of-a-parabola.php) of the parabola whose vertex form equation is  $y = (x - 2)^2 - 3$

HIDE ANSWER

vertex (vertex-of-a-parabola.php) is (2, -3)



<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem4.3>

## Part II

### Problem 5.1

What is the vertex (vertex-of-a-parabola.php) of a parabola with the following equation:  
 $y = 2(x-3)^2 + 4$  ? Does the parabola open upwards or downwards?



HIDE ANSWER

The vertex (vertex-of-a-parabola.php) is (3,4) and it opens upwards since a is positive( it is 2), it opens upwards.


<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem5.1>
*Problem 5.2*

If a parabola's equation is  $y = 3(x+3)^2 + 4$ , what is its vertex? Which way does it open?

HIDE ANSWER

Vertex = (-3,4), and it opens upwards since a is positive.


<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem5.2>
*Problem 5.3*

A parabola has the equation  $y = -22(x - 9)^2 + 5$ . What is its vertex? Which way does the parabola open?

SHOW ANSWER


<https://www.mathwarehouse.com/geometry/parabola/standard-and-vertex-form.php#problem5.3>

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*next to* [Converting between Forms \(standard-to-vertex-form.php\)](#)

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