Goal: Find graph information from standard form of a quadratic

Objectives: I can...

- Find the vertex, axis of symmetry, x-int(s), and y-int from a standard form quadratic equation.
- Graph standard form quadratic equations by finding important parts of a graph.
- Use three methods to solve quadratic equations.

Essential Questions

- Why do you need different methods for solving standard form equations?
- What method always works?
- How do you know when you do not have any x-intercepts?

By multiplying factored form equations out you get another form.

Multiply the quadratic factored form equations below:

1. $(2x - 1)(5x + 3)$

2. $3x(7x - 3)$

3. $-4(x + 4)(2x + 5)$

4. $-(3x + 1)(x - 2)$

Quadratic Form #2: Standard Form

Standard form is any quadratic in the form of $y = ax^2 + bx + c$. In this form the "a" tells us about the reflection and dilation of the parabola and the "c" gives us the y-intercept (this is because the "a" and "b" value go to zero once zero is put in for x).

Examples of standard form quadratic equations:

1. $y = 3x^2 - 4x + 2$
2. $f(x) = -2x^2 - 5$
3. $g(x) = -x^2 + 4x$
4. $y = 0.7x^2$

***Can you determine the dilation, reflection, max/min, up/down, and y-intercept of these four examples just from the equaiton?

Quadratic Form #2: Standard Form

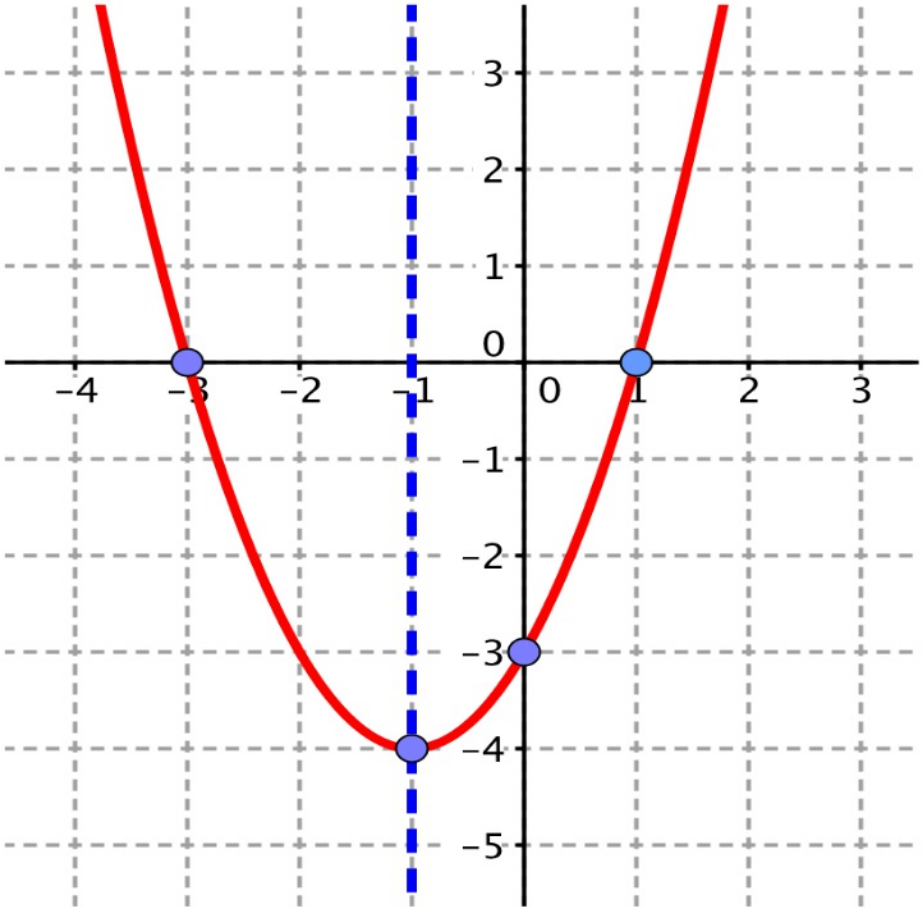
In standard form, you can calculate all of the important features of a graph:

1. Vertex

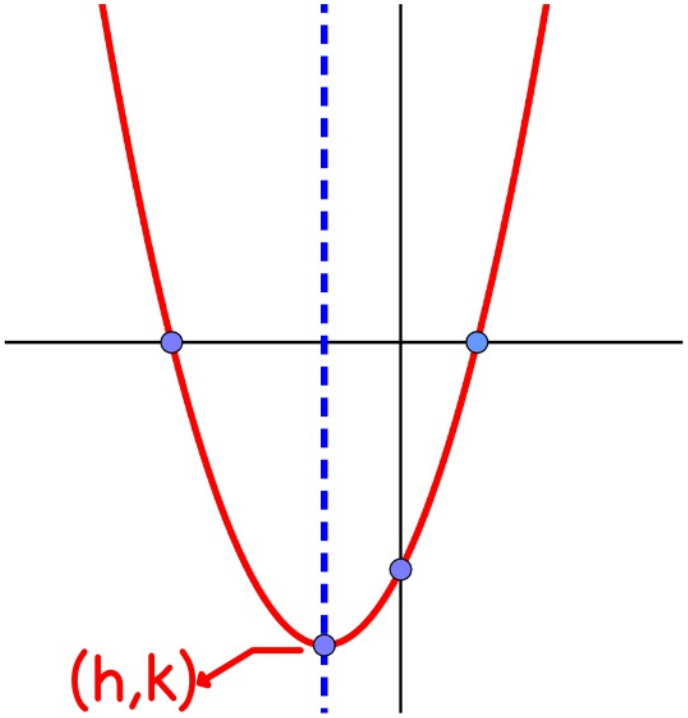
2. Axis of Symmetry

3. y-intercept

4. x-intercept/zeros/roots



The Vertex and Standard Form



The generic point for the vertex of a parabola is (h,k) where h is the x-coordinate of the vertex and k is the y-coordinate of the vertex. You can find these two coordinates from standard form with the use of a simple formula. The formula to find h is as follows:

$$h = \frac{-b}{2a}$$

where "a" and "b" are the "a" and "b" from the standard form equation. Once you find h you can plug it back in to the equation to get your k value for the vertex.

Vertex

Find the vertex of $y = 4x^2 + 2x - 8$

Vertex

Find the vertex of $y = 5x^2 - 20x + 1$

Vertex

Find the vertex of $y = -4x^2 + 3x + 11$

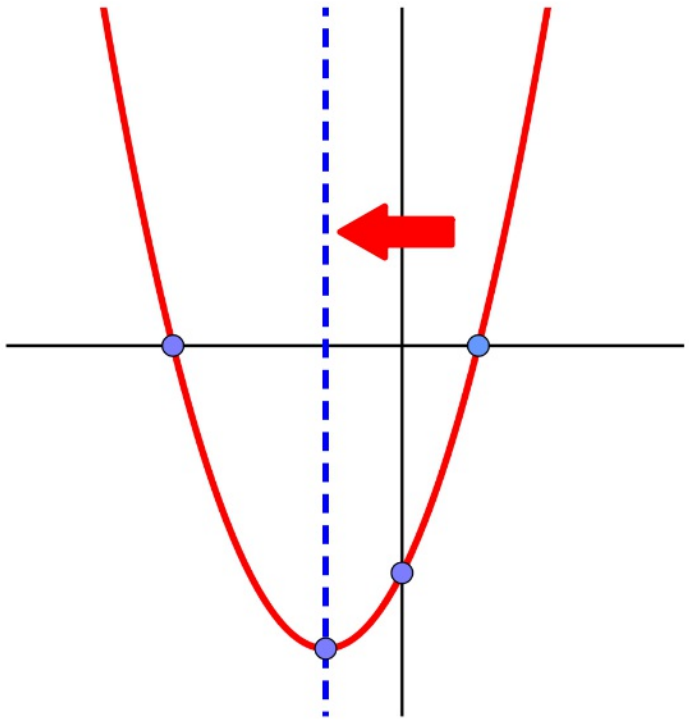
Vertex

Find the vertex of $y = -2x^2 - 6$

Vertex

Find the vertex of $y = 10x^2$

The Axis of Symmetry and Standard Form



The axis of symmetry is the vertical line that goes through the vertex. The equation for the axis of symmetry is x = h (this is the same h as in the vertex). Therefore -b/2a will also give you the value for the axis of symmetry equation.

A. of S.

Find the axis of symmetry of $y = x^2 - 4x + 2$

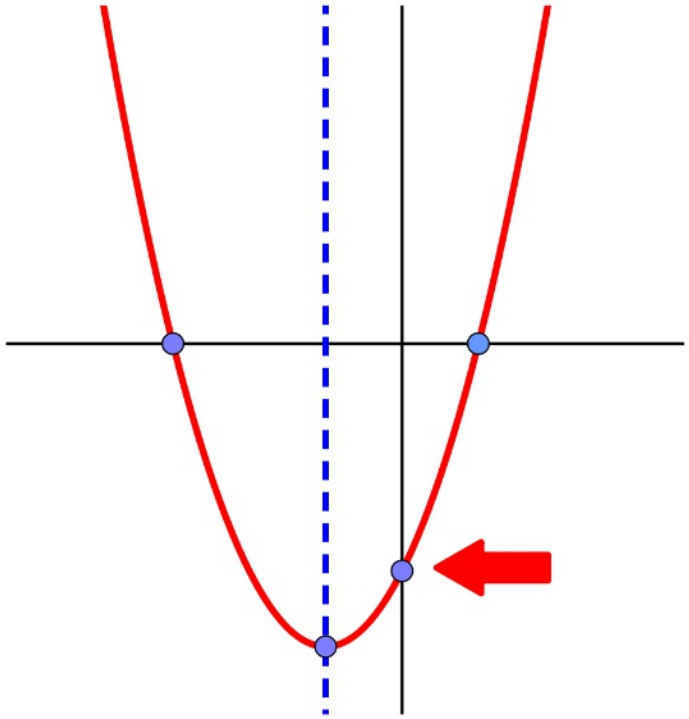
A. of S.

Find the axis of symmetry of $y = 3x^2 - x + 8$

A. of S.

Find the axis of symmetry of $y = -5x^2 + 3x$

The y-int and Standard Form



The y-intercpet in standard form of a quadratic is found by evaluating when x is 0. You may notice that this value is the same as the "c" value in standard form.

Find the y-intercept of each

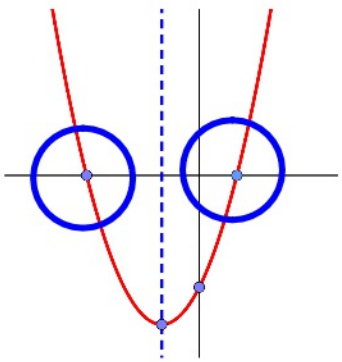
1. $f(x) = -6x^2 - 8x + 4$

2. $y = 2.4x^2 + 5.1x - 10$

3. $g(x) = 4x^2 - 3x$

4. $y = -11x^2$

The x-int and Standard Form



As we have seen already, x-intercepts/zeros/roots can be found by plugging 0 in for x and solving. When you do this with standard form it causes a problem because sometimes it is hard to get x by itself because there is a x^2 term and an x term

Example: $0 = 3x^2 - 4x + 7$

Because of this we have 3 methods to help us out:

1. Factor the problem and set each factor equal to zero.

2. If there is no x term (linear term) than you can solve by using inverses.

3. If you can't do #1 or #2 you can ALWAYS use the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

x-int

Find the x-intercept(s) of $y = x^2 - 8x + 7$

x-int

Find the x-intercept(s) of $y = x^2 - 5$

x-int

Find the zero(s) of $y = 2x^2 + x - 3$

x-int

Find the x-intercept(s) of $y = x^2 + 4x + 9$

x-int

Find the root(s) of $f(x) = -3x^2 - x + 11$

x-int

Find the x-intercept(s) of $y = x^2 - 2x + 1$

x-int

Find the zero(s) of $y = -20x^2 + 78x + 7$

x-int

Find the zero(s) of $y = -9x^2 + 14x$

x-int

Find the zero(s) of $y = 5x^2$

x-int

Find the zero(s) of $y = -4x^2 + 12$

x-int

Find the zero(s) of $y = 6x^2 + 4$

Graph

Find the x-int, y-int, axis of symmetry and vertex and then graph of $y = x^2 + 5x + 6$

Graph

Find the x-int, y-int, axis of symmetry and vertex and then graph of $y = -3x^2 + 4x + 7$

Graph

Find the x-int, y-int, axis of symmetry and vertex and then graph of $y = 2x^2 + 8x$

Graph

Find the x-int, y-int, axis of symmetry and vertex and then graph of $y = -7x^2$