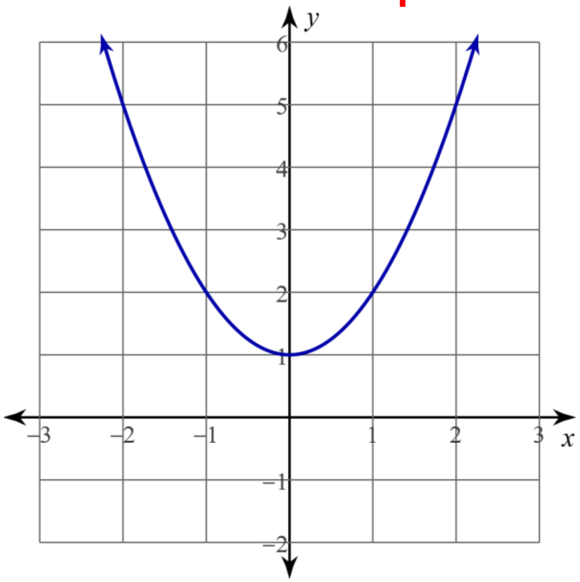
Math-2

Lesson 5-6

Finding the Zeroes of Quadratic Equations by Taking Square roots.

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

No x-intercepts



$$y = x^2 + 1$$

Find the "zeroes" of the equation.

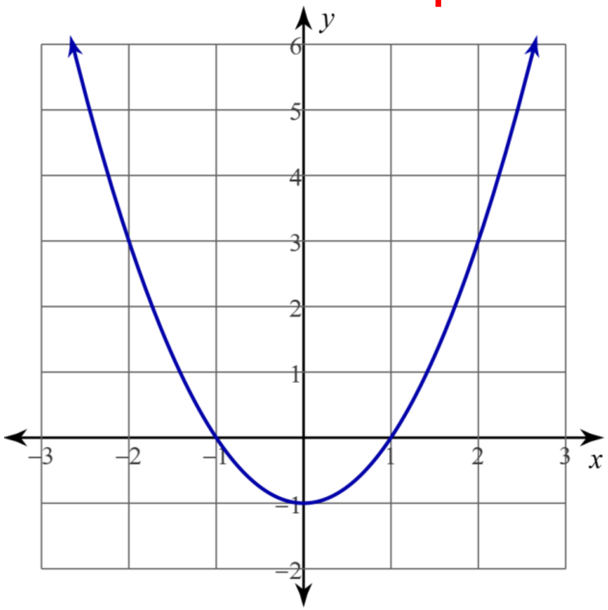
$$0 = x^2 + 1$$

$$-1 = x^2$$

$$\sqrt{-1} = \sqrt{x^2}$$

$$\boxed{x = \pm i}$$

two x-intercepts



$$y = x^2 - 1$$

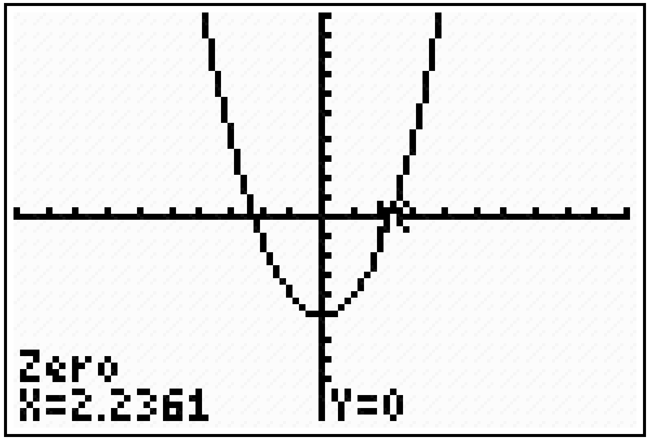
$$0 = x^2 - 1$$

$$1 = x^2$$

$$\sqrt{1} = \sqrt{x^2}$$

$$\boxed{x = \pm 1}$$

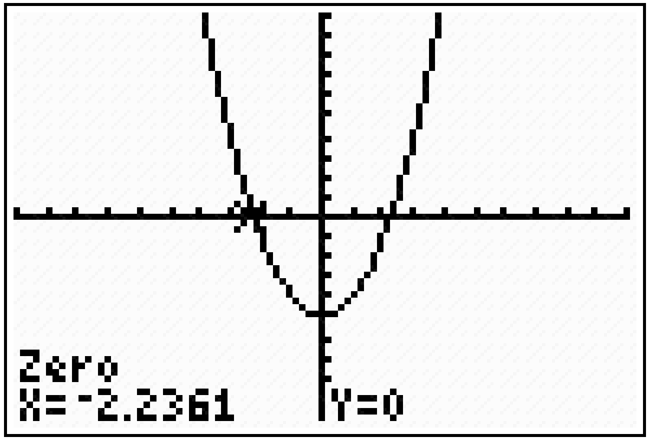
Zeroes of Quadratic Equations



$$y = x^2 - 5$$

$$0 = x^2 - 5$$

$$x^2 = 5$$



$$x = +\sqrt{5}, -\sqrt{5}$$

$$x \approx +2.2361, -2.2361$$

Find the zeroes of the quadratic equation.

Set y = 0 then "Isolate the square, undo the square"

$$y = x^2 - 12$$

$$0 = x^2 - 12$$

$$12 = x^2$$

$$\sqrt{12} = \sqrt{x^2}$$

$$\boxed{x = \pm 2\sqrt{3}}$$

$$y = 3x^2 - 18$$

$$0 = 3x^2 - 18$$

$$18 = 3x^2$$

$$6 = x^2$$

$$\sqrt{6} = \sqrt{x^2}$$

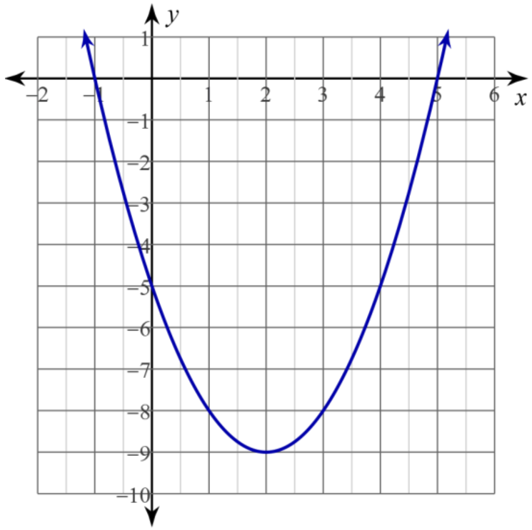
$$\boxed{x = \pm\sqrt{6}}$$

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

1. Which form of the quadratic is this? Vertex Form

2. What are the transformations of the parent function?

Right 2, down 9



3. What is the vertex? (2, -9)

4. Draw a graph of the function.

5. Are the zeroes real or imaginary?

$$x = 5, -1$$

6. What are the zeroes of the equation?

The graph crosses the x-axis

→ it has real number zeroes.

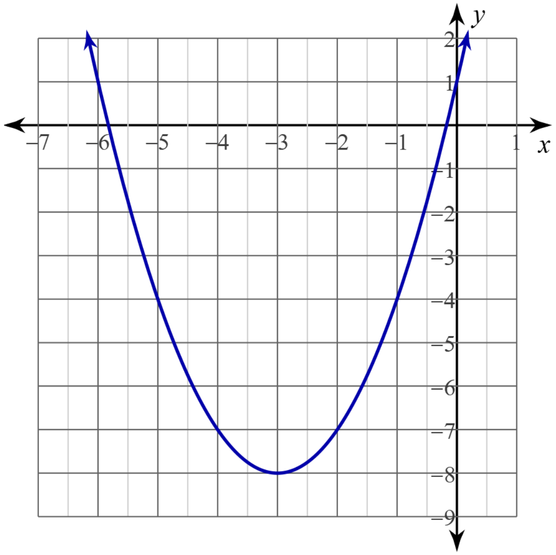
$$y = (x+3)^2 - 8$$

1. Which form of the quadratic is this? Vertex Form

2. What are the transformations of the parent function?

Left 3, down 8

3. What is the vertex? (-3, -8)



4. Draw a graph of the function.

5. Are the zeroes real or imaginary?

The graph crosses the x-axis → it has real number zeroes.

If you can't factor the Standard Form version of the Vertex Form equation that must be a way to find the zeroes!

Vertex form → take square roots.

$$y = a(x-h)^2 + k \qquad y = (x+3)^2 - 8$$

→ Let y = 0 $\quad 0 = (x+3)^2 - 8$

Isolate the squared term $\quad 8 = (x+3)^2$

"take square roots" $\quad \sqrt{8} = \sqrt{(x+3)^2}$

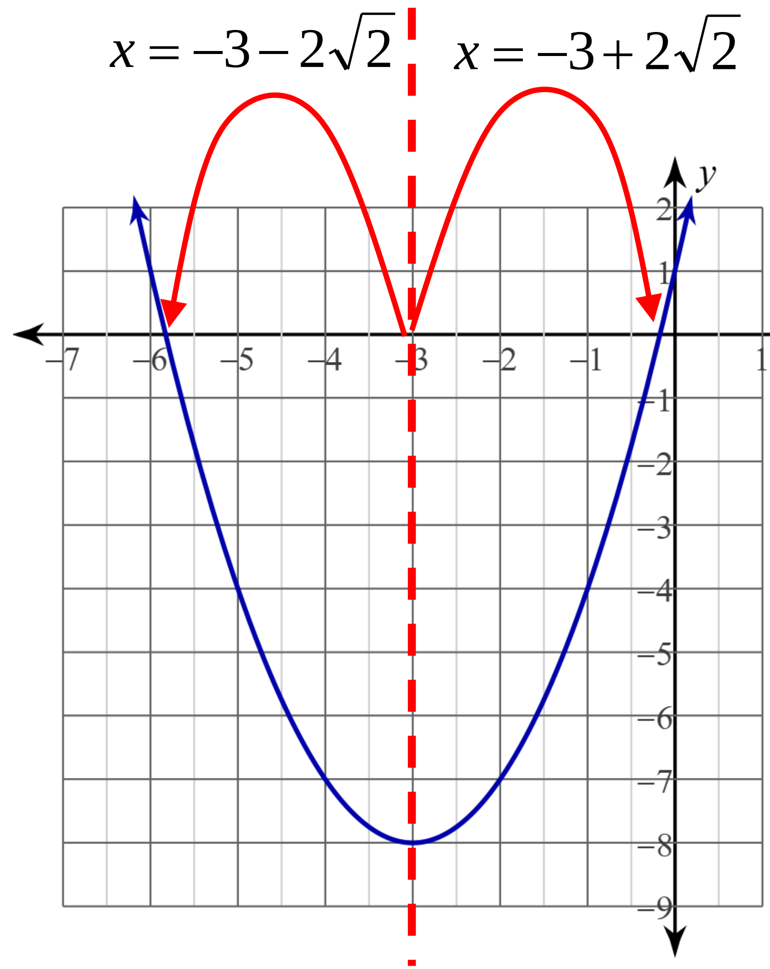
$\pm\sqrt{8} = x + 3$ $\quad$ Simplify the radical

$$\pm\sqrt{2*2*2} = x + 3$$

$\pm 2\sqrt{2} = x + 3$ $\quad$ Solve for 'x'

$$x = -3 \pm 2\sqrt{2}$$

x-coord of vertex



This method words without having to covert to standard form then to intercept form (by factoring) in order to find the zeroes.

Vertex form → extract a square root.

$$y = a(x-h)^2 + k \qquad y = (x-1)^2 - 9$$

Let y = 0 $\quad 0 = (x-1)^2 - 9$

Isolate the squared term $\quad 9 = (x-1)^2$

"take square roots" $\quad \sqrt{9} = \sqrt{(x-1)^2} \qquad \pm 3 = x - 1$

Solve for 'x' $\quad 1 \pm 3 = x \quad$ simplify $\quad x = 4, -2$

Or, covert to standard form, then intercept form.

$$y = (x-1)^2 - 9$$

$$y = x^2 - 2x + 1 - 9$$

$$y = x^2 - 2x - 8$$

$$y = (x-4)(x+2)$$

$$0 = (x-4)(x+2)$$

$$x = 4, -2$$

$$y = (x-2)^2 - 4$$

Let y = 0

$$0 = (x-2)^2 - 4$$

Isolate the squared term $4 = (x-2)^2$

"Extract a square root" $\pm\sqrt{4} = \sqrt{(x-2)^2}$

$$\pm 2 = x - 2$$

Solve for 'x' $2 \pm 2 = x$

$x = 2 + 2$ simplify $x = 4{,}0$

$$x = 2 - 2$$

Or, covert to standard form, then intercept form.

$$y = (x-2)^2 - 4$$

$$y = x^2 - 4x + 4 - 4$$

$$y = x^2 - 4x$$

$$y = x(x-4)$$

$$0 = x(x-4)$$

$$x = 0, 4$$

But the convert to standard form then intercept form doesn't always work (if the standard form can't be factored).

$$y = 2(x+7)^2 - 10$$

$$y = 2(x^2 + 14x + 49) - 10$$

$$y = 2x^2 + 28x + 96 - 10$$

$$y = 2x^2 + 28x + 86$$

$$y = x^2 + 14x + 43$$

43 is a prime number, it only has factors of 1 and 43

$$y = 2(x+7)^2 - 10$$

Let y = 0

$$0 = 2(x+7)^2 - 10$$

Isolate the Square term

$$10 = 2(x+7)^2$$

Divide by 2 (both sides)

$$5 = (x+7)^2$$

"take square roots"

$$\pm\sqrt{5} = \sqrt{(x+7)^2}$$

$$\pm\sqrt{5} = x + 7$$

subtract 7 from both sides

$$-7 \pm \sqrt{5} = x$$

$$x = -7 + \sqrt{5} \qquad x = -7 - \sqrt{5}$$

Find the "zeroes" by "Extracting a square root"

$$y = (x-1)^2$$

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

$$y = 3(x+4)^2 - 12$$

$$y = 2(x-7)^2 - 18$$