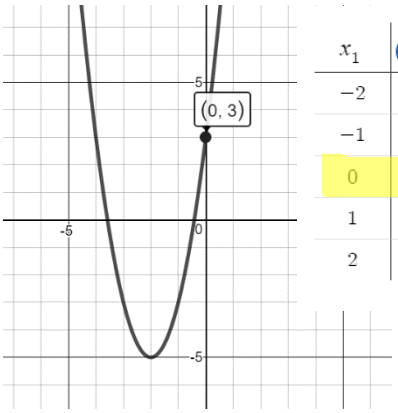
Quadratics in Vertex Form:

x - and y – intercepts

A quadratic can be written in many forms:

- Vertex Form: $y = a(x-h)^2 + k$
- Transformation Form: $y = a(bx-c) + d$
- Factor Form: $y = a(x-b)(x-c)$
- Standard Form: $y = ax^2 + bx + c$

This station will focus on the x- and y-intercepts of quadratic functions. **x-intercepts** are the point(s) on a quadratic graph that intersect with the **x-axis**, and the **y-intercept** is the point on a quadratic graph that intersects with the **y-axis**.



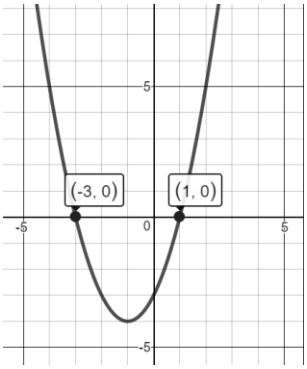
x_1	$g(x_1)$
−2	−5
−1	−3
0	3
1	13
2	27

y-intercepts are defined as the point $(\mathbf{0}, \boldsymbol{y_1})$ on the graph of any function. Using quadratic vertex form $\boldsymbol{y = a(x-h)^2 + k}$, the y-intercept can be found by substituting $\boldsymbol{x = 0}$ into the equation and simplifying.

Example: Find the y-intercept of $\boldsymbol{g(x) = 2(x+2)^2 - 5}$

$\boldsymbol{g(0) = 2(0+2)^2 - 5 = 8 - 5 = 3}$, so

$\boldsymbol{(0, 3)}$ is the y-intercept of $\boldsymbol{g(x)}$.



Quadratic functions can have 2, 1, or no **x-intercepts**. To find x-intercepts using vertex form $\boldsymbol{y = a(x-h)^2 + k}$, substitute $\boldsymbol{y = 0}$ into the equation and solve for x.

Example: find the x-intercept(s), if any, of $\boldsymbol{h(x) = (x+1)^2 - 4}$

$$\mathbf{0} = (\boldsymbol{x}+\mathbf{1})^2 - \mathbf{4}$$

$$\mathbf{4} = (\boldsymbol{x}+\mathbf{1})^2$$

$$\pm\sqrt{\mathbf{4}} = \boldsymbol{x}+\mathbf{1}$$

$$-\mathbf{1} \pm \mathbf{2} = \boldsymbol{x}$$

$$\boldsymbol{x} = -\mathbf{3}, \mathbf{1}$$

so the x-intercepts of $\boldsymbol{h(x)}$ are $\boldsymbol{(-3, 0)}$ ***and*** $\boldsymbol{(1, 0)}$.

***Note:** taking the **square root of a negative** number results in an imaginary number, meaning **x has no real solution**. Therefore, **there are no x-intercepts**.