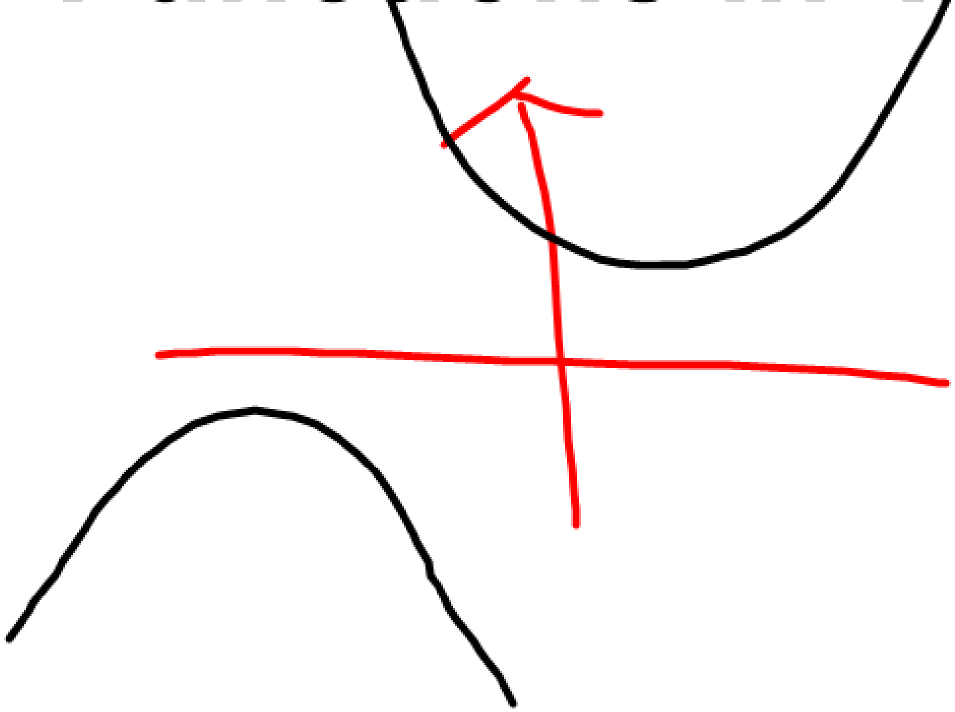
The x-intercepts and y-intercept of Quadratic Functions in Vertex Form



Every quadratic function must have a y-intercept.

To calculate the y-intercept, **set x to zero** and work out the value of y.

Example: **Standard Form**

Determine the y-intercept for the following functions:

$f(x) = 4x^2 + 5x - 2$

let $x = 0$

$f(0) = 4(0)^2 + 5(0) - 2 = -2$

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

$$f(x) = -3x^2 - 6x + 1$$

What did you notice?

When a quadratic function is written in standard form, the **y-intercept** is always the same as the **constant term**.

So you don't really need to calculate anything - just look at the constant term.

Example: Vertex Form

Determine the y-intercept for the following functions:

$f(x) = (x + 2)^2 - 7$

let $x = 0$

$f(0) = (0 + 2)^2 - 7$

$f(0) = (2)^2 - 7$

$f(0) = -3$

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

let $x = 0$

$f(0) = -2(0 - 1)^2$

$= -2(-1)^2$

$= -2$

$f(x) = 3(x + 6)^2 - 90$

$f(0) = 3(0 + 6)^2 - 90$

$= 3(36) - 90$

$= 108 - 90 = 18$

What did you notice?

When a quadratic function is written in **vertex form**, there is no really easy way to find the **y-intercept.**

You always have to **calculate it** by setting x to zero.

A quadratic function may have one, two or no x-intercepts.

To calculate the x-intercepts (if any), **set y to zero** and work out the value(s) of x.

THIS IS A NEW KIND OF SOLVING PROCEDURE.

Example: Vertex Form

Determine the x-intercept(s), if any, for the following functions:

$f(x) = (x + 2)^2 - 9$

let $y=0$

$\boxed{0 = (x+2)^2 - 9}$

$\sqrt{9} = \sqrt{(x+2)^2}$

$\pm 3 = x+2$

$-2 \pm 3 = x$

$-2+3=x$

$1=x$

$-2-3=x$

$-5=x$

$0 = (x+2)^2 - 9$

$0 = (x+2)(x+2) - 9$

$= x^2 + 2x + 2x + 4 - 9$

$0 = x^2 + 4x - 5$

$0 = (x-1)(x+5)$

$x - 1 = 0$ OR $x + 5 = 0$

$x = 1$ $x = -5$

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

let $y = 0$

$0 = -2\underline{(x-1)}^2 + 8$

$$\frac{-8}{-2} = \frac{-\cancel{2}(x-1)^2}{-\cancel{2}}$$

$\sqrt{4} = \sqrt{(x-1)^2}$

$\pm 2 = x - 1$

$1 \pm 2 = x$

$1 + 2 = x$

$3 = x$

$1 - 2 = x$

$-1 = x$

$f(x) = 10(x + 6)^2 - 90$

let $y = 0$

$0 = 10(x+6)^2 - 90$

$\frac{90}{10} = \frac{10(x+6)^2}{10}$

$\sqrt{9} = \sqrt{(x+6)^2}$

$\pm 3 = x+6$

$-6 \pm 3 = x$

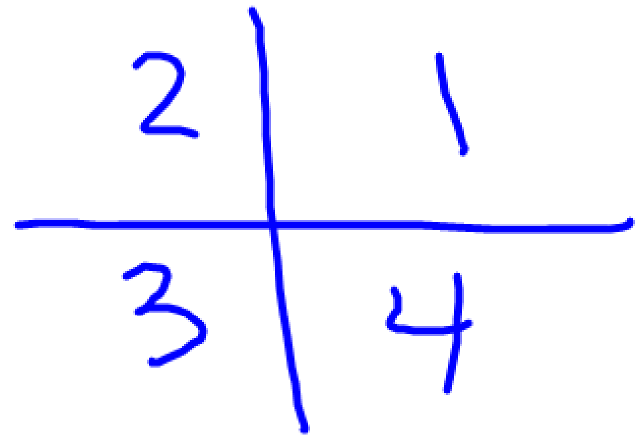
$-6-3=x$	$-6+3=x$
$-9=x$	$-3=x$

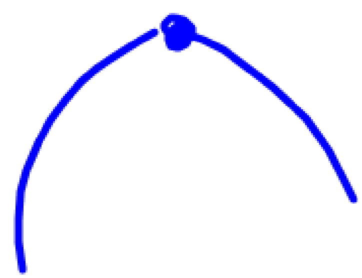
$f(x) = -3(x + 6)^2 - 27$

let $y = 0$

$$\frac{27}{-3} = \frac{-3(x+6)^2}{-3}$$

$$\cancel{\sqrt{-9} = \sqrt{(x+6)^2}}$$





$f(x) = 3(x + 6)^2$

let $y = 0$

$$\frac{0}{3} = \frac{3(x+6)^2}{3}$$

$$\sqrt{0} = \sqrt{(x+6)^2}$$

$$0 = x + 6$$

$$-6 = x$$

You Try:

Determine the y-intercept and x-intercepts (if any):

$f(x) = -2(x - 4)^2 + 50$

y int

let $x=0$

$y = -2(0-4)^2 + 50$

$= -2(-4)^2 + 50$

$= -32 + 50$

$= 18$

x int

let $y=0$

$0 = -2(x-4)^2 + 50$

$-50 = -2(x-4)^2$

$25 = (x-4)^2$

$\pm 5 = x-4$

$4 \pm 5 = x$

$9 = x$ $\quad$ $-1 = x$

Assignment:

- add another column to your chart from yesterday for the y-intercept and calculate the y-intercept for the ten functions in the chart.

- determine the x-intercepts for the functions on the handout I give you today.