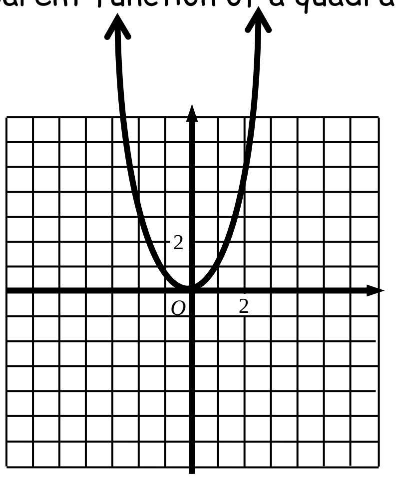
Name ______________________________ Date _________________

Reporting Category 5 Notes (A.9.D. & A.10.A)

Quadratic Functions are graphs in the shape of a parabola ("u" shape). Depending on the equation of a quadratics expression the graph can either open up or down.

The standard form for a quadratic equation is $Ax^2 + Bx + C = 0$.
Where A, B, & C are all numbers.

In the parent function of a quadratic: $y = x^2$, the $A = 1$, and the B & C are equal to zero.



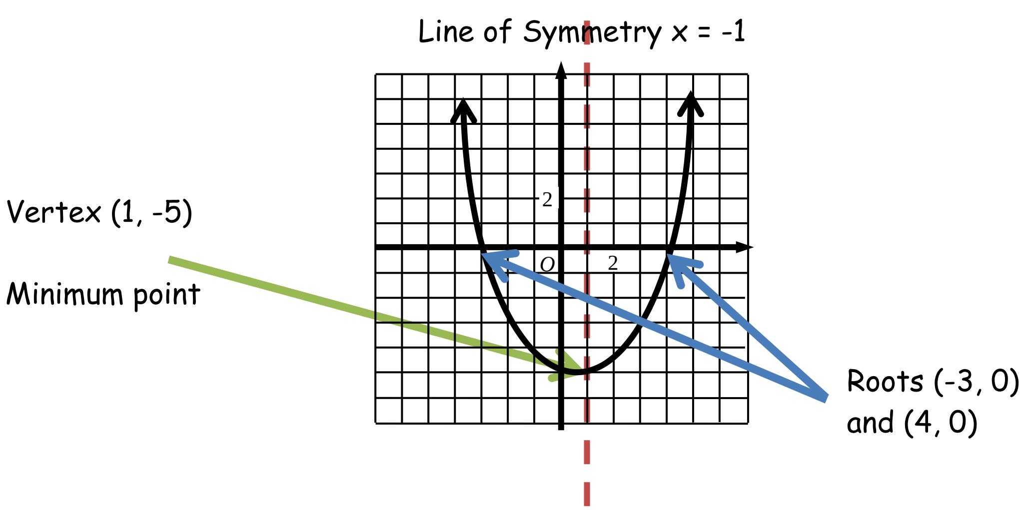
The parent function of the quadratic is shown at the right. We can identify many components of a quadratic graph by looking at it.

The *vertex* is the <u>maximum</u> or <u>minimum</u> point on the graph. It will always be in the center of the "u".

A <u>maximum</u> means it is at the *top* of the "u".
A <u>minimum</u> means it is at the *bottom* of the "u".

The *line of symmetry* is the line that divides the graph in half. The line of symmetry always goes through the vertex point and is written in the form of an equation x = *the x value at the vertex*.

The roots are where the quadratic graph crosses or touches the x-axis. The roots are also called x-intercepts, zeros, or solutions. Generally in a quadratic there will be two roots. Sometimes though there is only one or even none.



Name ______________________________ Date _________________

Reporting Category 5 Notes (A.9.D. & A.10.A)

To solve a quadratic equation means to find the roots.

***Remember roots are the same thing as x-intercepts, zeros, or solutions!**

Ultimately, you have to factor the quadratic expression to find the solutions.
Factoring quadratics that are in standard form ($Ax^2 + Bx + C = 0$) can be broken up into specific steps.

Step 1: Make a product/sum table

Example:

$2x^2-11x+5$

P= 1st term X 3rd term	S= 2nd term
P= 10	S= -11
5, 2	7
-5, -2	-7
10, 1	11
-10, -1	***-11***

Step 2: Put selected factors in the sets. (x -10)(x -1)

Step 3: Put each factor over the 1st coefficient. Simplify and reduce.

$$\left(x - \frac{10}{2}\right)\left(x - \frac{1}{2}\right) = (x - 5)\left(x - \frac{1}{2}\right)$$

Step 4: If the number reduces evenly you're done. If not, take the denominator of the fraction that doesn't become a whole number and swing it up to become the x coefficient. Factors: (x – 5)(2x – 1)

Name ______________________________ Date _________________

Reporting Category 5 Notes (A.9.D. & A.10.A)

Sometimes quadratics don't factor perfectly into whole numbers. When this happens, you must use the Quadratic Formula to solve for the roots.

Quadratics Formula $\boxed{x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$

Example: Find the solutions for "x" in the equation $3x^2 = 2x + 1$.

- First, put the equation in standard form.
  $3x^2 - 2x - 1 = 0$
- Second, state the values of a, b, and c.
  $a = 3,\ b = -2,\ c = -1$
- Then, substitute the values of a, b, and c into the formula:

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-1)}}{2(3)}$$

$\boxed{b = -2}$ $\boxed{a = 3}$ $\boxed{c = -1}$

and simplify………

$$x = \frac{2 \pm \sqrt{4 - (-12)}}{6}$$

$$x = \frac{2 \pm \sqrt{16}}{6}$$

$$x = \frac{2 \pm 4}{6}$$

$$x = \frac{2+4}{6} = \frac{6}{6} = 1$$

$$x = \frac{2-4}{6} = \frac{-2}{6} = -\frac{1}{3}$$

The solutions to this quadratic equation are (1, 0) and (-1/3, 0)