Quadratic equations in three forms:

Here are the three forms a quadratic equation should be written in:

1) **Standard form**: $y = ax^2 + bx + c$ where the a,b, and c are just numbers
2) **Factored form**: $y = (ax + c)(bx + d)$ again the a,b,c, and d are just numbers
3) **Vertex form**: $y = a(x + b)^2 + c$ again the a, b, and c are just numbers

Today we are going to learn WHY each form is beneficial and HOW to switch between the forms.

1) First let's practice identifying the form of a few quadratics:

$Y = 3x^2 - 2x + 7$	$Y = 3(x + 7)^2 - 4$	$Y = (2x - 1)(x + 2)$
$Y = (3x - 1)(x - 5)$	$Y = 3x^2 - 16x + 5$	$Y = -5(x - 6)^2 + 22$

2) Re-write each of these in standard form:

$Y = (3x - 1)(x + 8)$	$Y = 3(x - 7)^2 - 4$	$Y = -\frac{1}{2}(x + 3)^2 + 7$

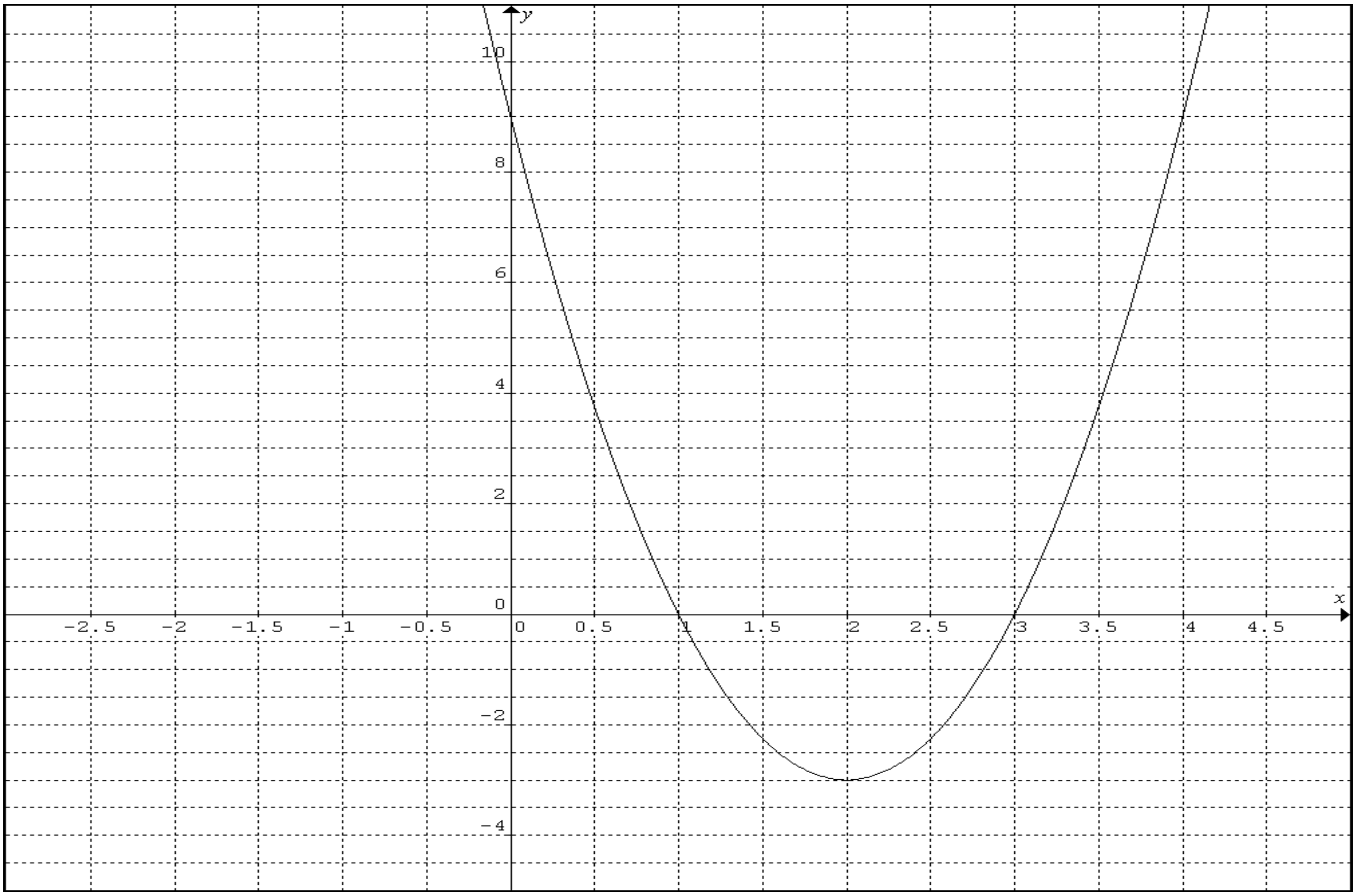
3) So why are there three different forms of a quadratic equation??? To answer that question it is first important to understand some of the key features of a parabola (that is the name of the graph of a quadratic equation)

Roots = the x-values where the parabola intersect the x-axis, these are sometimes called x-intercepts.

Y intercept = the y value where the parabola intersect the y-axis

Vertex = the coordinates (x,y) where the parabola is "turning", this point is also called the extrema (in other words it is the spot where the parabola reaches a maximum or a minimum.

Let's look at the graph of a quadratic equation



Here are the equations of that one parabola written in the different forms you should know at this point.

In STANDARD FORM $Y = 3x^2 - 12x + 9$

In FACTORED FORM $Y = 3(x - 1)(x - 3)$

In VERTEX FORM $Y = 3(x - 2)^2 - 3$

The y-intercept of that graph is ___________

The roots of that graph are ______ and _______

The vertex of that graph is (_____,_____)

CAN YOU SEE HOW EACH OF THE FORMS TELLS YOU A DIFFERENT KEY FEATURE OF THE GRAPH???

Finish each statement…

When written in standard form the ______________ is ____

When written in factored form the ______________ are ____

When written in vertex form the ______________ is ____

For the following equations, determine the key features of the graph without actually graphing it.

$Y = (x-4)^2 - 25$	$Y = (x+7)^2 - 9$
Vertex = Roots = y-intercept =	Vertex = Roots = y-intercept =

4) So now that you can re-write equations into the different forms and you can identify the key features of the parabolas without actually graphing them, you should be able to sketch their graphs simply by investigating the key features…

Sketch each of those parabolas based off the key features

HW:

1) Sketch a parabola whose key features are given

Vertex = (1, -12) Roots = -1 and 3 y-intercept = -9	Vertex = (.5 ,6.25) Roots = -1 and 3 y-intercept = 6

2) Put the following quadratics into standard form:

a. $Y = 3(x - 5)^2 - 7$

b. $y = 3(x - 2)(x + 5)$

3) **FACTORING by using the G.C.F that stands for "greatest common factor" **

The other way to factor expression (when applicable) is called GCF factoring. This is when every term in an expression has a common factor, and that common factor can be divided out of each term. This is really the reverse of the distribution property…look at the following examples.

$3x(x^2 - 2x) = 3x^3 - 6x^2$ so the reverse of that is $3x^3 - 6x^2 = 3x(x^2 - 2x)$.

The 3x is a common factor to the terms $3x^3$ and $-6x^2$ so we factor it out and write down what is left. Try to factor the following expressions…again you are trying to think of a term that is a common factor to all the original terms in the given expression.

a. $6x^2 - 3x$

b. $2x^3 - 8x^2 + 24x$

c. $4x^5 - 20x^2$