GSE Algebra 1 **7.3 – notes** Name: _____

Graphing in standard form.

What is the equation for vertex form:

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

Equation for standard form:

$y = ax^2 + bx + c$

Let's multiply through to get into standard form.

1) $f(x) = 4(x-2)^2 - 3$

$4(x-2)(x-2) - 3$

$(4x-8)(x-2) - 3$

	$4x$	-8
x	$4x^2$	$-8x$
-2	$-8x$	16

$4x^2 - 16x + 16 - 3$

$y = 4x^2 - 16x + 13$ ← y-intercept

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

$-(x+3)(x+3) + 2$

$(-x-3)(x+3) + 2$

	$-x$	-3
x	$-x^2$	$-3x$
3	$-3x$	-9

$-x^2 - 6x - 9 + 2$

$y = -x^2 - 6x - 7$

*A stays the same

3) $f(x) = \frac{1}{2}(x+1)^2$

$\frac{1}{2}(x+1)(x+1)$

$(\frac{1}{2}x + \frac{1}{2})(x+1)$

	$\frac{1}{2}x$	$\frac{1}{2}$
x	$\frac{1}{2}x^2$	$\frac{1}{2}x$
1	$\frac{1}{2}x$	$\frac{1}{2}$

$y = \frac{1}{2}x^2 + 1x + \frac{1}{2}$

Now let's look at a problem in vertex form and standard form.

$f(x) = (x-1)^2 - 3$ → Down 3, Right 1

What form: Vertex form

List out all the information needed to graph.

Vertex $(1, -3)$

$(x-1)^2 - 3$

$(x-1)(x-1) - 3$

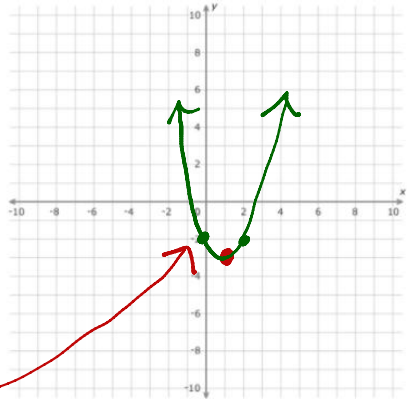
	x	-1
x	x^2	$-1x$
-1	$-1x$	1

$x^2 - 2x + 1 - 3$

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

x	y
0	-2
1	-3
2	-2

$(0-1)^2 - 3$



Let's look at this problem. $f(x) = x^2 - 2x - 2$ Standard $y = ax^2 + bx + c$ Can you easily find the vertex here? No

Let's list out the a, b and c for the equation above.

a: 1 b: −2 c: −2

We need to use $x = -\frac{b}{2a}$ standard → vertex

Let's find the x – value of the vertex 1st. **(H)**

$\frac{-b}{2a} = \frac{-(-2)}{2(1)} = 1$ h

Then substitute x into the equation to find the y – value. **(K)**

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

$(1)^2 - 2(1) - 2 = -3$ k

Find **a.**

Now let's create the vertex form equation: $y = a(x-h)^2 + k$

$y = 1(x-1)^2 - 3$

How does this equation compare to the previous problem? Same? Different?

A stays same

Std. form → y-int

Vertex form → vertex

Let's try some more. We are going to convert from **STANDARD FORM** to **VERTEX FORM** (so we can **GRAPH**).

Standard → Vertex

1) $y = -4x^2 - 8x + 7$

a=−4 b=−8 c=7

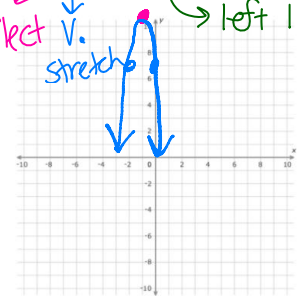
$\frac{-b}{2a} = \frac{-(-8)}{2(-4)} = -1$ h

$-4(-1)^2 - 8(-1) + 7 = 11$ k

$y = -4(x+1)^2 + 11$

Reflect ↓ V. stretch ↓ left 1 ↓ up 11

Vertex (−1, 11)



x	y
−2	7
−1	11
0	7

2) $y = \frac{1}{2}x^2 + 10x - 1$

$a = \frac{1}{2}$ b=10 c=−1

$\frac{-(10)}{2(\frac{1}{2})} = -10$ h

$\frac{1}{2}(-10)^2 + 10(-10) - 1 = -51$ k

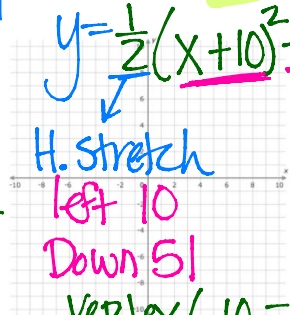
$y = \frac{1}{2}(x+10)^2 - 51$

H. stretch

left 10

Down 51

Vertex (−10, −51)



3) $y = x^2 + 6$

a=1 b=0 c=6

$\frac{-(0)}{2(1)} = 0$ h

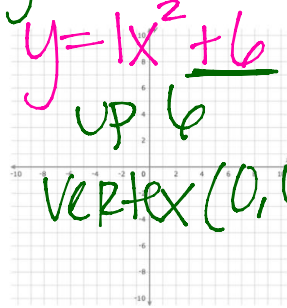
$(0)^2 + 6 = 6$ k

$y = 1(x-0)^2 + 6$

$y = 1x^2 + 6$

up 6

Vertex (0, 6)



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

$a=-1$ $b=-2$ $c=0$

$\frac{-(-2)}{2(-1)} = -1$ h

$-(-1)^2 - 2(-1) = 1$ k

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

reflect

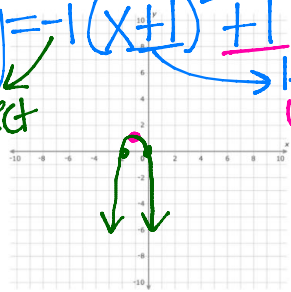
left 1

up 1

Vertex

$(-1,1)$

x	y
-2	0
-1	1
0	0



~~5) $f(x) = 3x^2 - 6x - 8$~~

6) $f(x) = 2x^2 + 3x - 5$

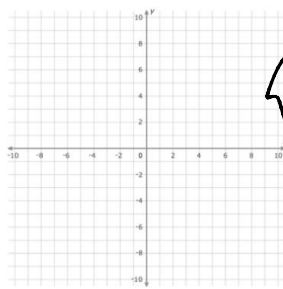
$a=2$ $b=3$ $c=-5$

$\frac{-(3)}{2(2)} = -0.75$ h

$2(-0.75)^2 + 3(-0.75) - 5$

$= -6.125$ k

$y=2(x+0.75)^2-6.125$



BIG PROBLEM!

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

Let's list out the information we know.

x-ints:

$x-2=0$ $x-4=0$

$+2 \quad +2$ $+4 \quad +4$

$x=2$ $x=4$

$(2,0)$ $(4,0)$

standard form:

	x	-2
x	x^2	$-2x$
-4	$-4x$	8

$y = x^2 - 6x + 8$

y-int:

$y = x^2 - 6x + 8$

$(0,8)$

Intercept

std.

Vertex

Convert to vertex form from standard form above.

$y = x^2 - 6x + 8$ $a=1$ $b=-6$ $c=8$

$\frac{-b}{2a} = \frac{-(-6)}{2(1)} = 3$ h

$(3)^2 - 6(3) + 8$

$= -1$ k

List all the shifts that occur. Now graph it!

$y = 1(x-3)^2 - 1$

Right 3

Down 1

Vertex

$(3,-1)$