LC MATH I

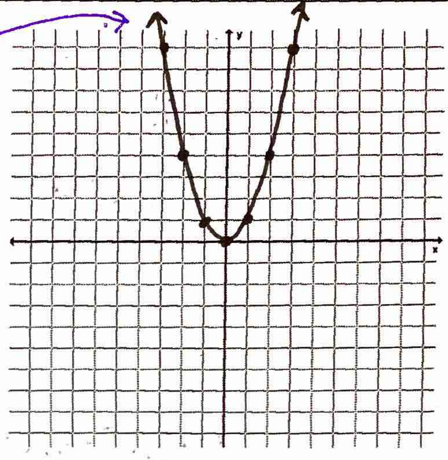
Final Review #5 : Quadratic Functions

The parent quadratic function, $y = x^2$, looks like this:

x	$y = x^2$
-3	$(-3)^2 = 9$
-2	$(-2)^2 = 4$
-1	$(-1)^2 = 1$
0	$0^2 = 0$
1	$1^2 = 1$
2	$2^2 = 4$
3	$3^2 = 9$

SYMMETRY

parabola



Vertex form of the quadratic function:

horizontal translation

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

vertex (h, k)

concavity + or −

vertical stretch or compression

vertical translation

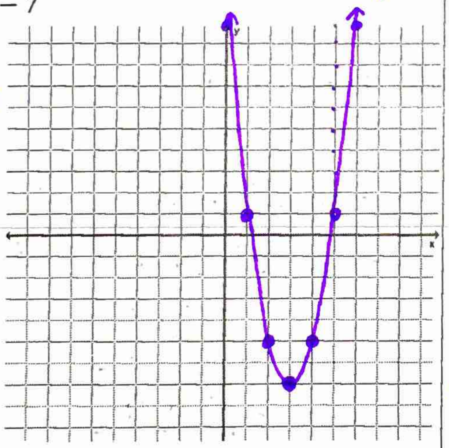
Examples:

1. $y = 2(x-3)^2 - 7$

Vertex: $(3,-7)$

Concavity: UP

Vertical stretch/compression: ~~stretch~~ by a factor of 2

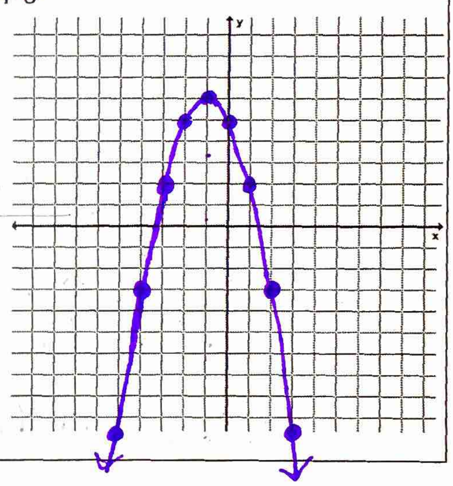


2. $y = -(x+1)^2 + 6$

Vertex: $(-1, 6)$

Concavity: DOWN

Vertical stretch/compression: since $a = -1$, NONE



Factored form of the quadratic function:

$$y = a(x - R_1)(x - R_2)$$

root #1 root #2

use the zero product property to find roots/ x-intercepts

Examples:

3. What are the roots of $y = 2(x-3)(x+4)$?

$y=0$

$0 = 2(x-3)(x+4)$

$x-3=0$ or $x+4=0$

$x=3$ $x=-4$

$\boxed{x = \{3, -4\}}$ $\boxed{(3,0) \text{ and } (-4,0)}$

4. What are the x-intercepts of $y = x^2 + 5x$?

$y=0$

$0 = x^2 + 5x$

$0 = x(x+5)$

$x=0$ or $x+5=0$

$x=-5$

$\boxed{x = \{0, -5\}}$

$\boxed{(0,0) \quad (-5,0)}$

Finding the y-intercept ← make $x=0$

$y=x^2+16x+71$

$y=(0)^2+16(0)+71$

$\boxed{y=71}$

$(0,71)$

$y=2(x-3)^2+10$

$y=2(0-3)^2+10$

$y=2(-3)^2+10$

$y=2(9)+10$

$y=18+10$

$\boxed{y=28}$ $(0,28)$

Rewriting in Standard Form:

$y=2(x+3)(x-7)$

$y=2(x^2-4x-21)$

$y=2x^2-8x-42$

TWO-STEP MULTIPLICATION

$y=2(x-3)^2+10$

$y=2(x-3)(x-3)+10$

$y=2(x^2-6x+9)+10$

$y=2x^2-12x+18+10$

$y=2x^2-12x+28$

MULTIPLY & COMBINE LIKE TERMS

Rewriting in Vertex Form to Find the Vertex: COMPLETE THE SQUARE

$y=x^2+16x+71$

$y=(x^2+16x \quad)+71$

	x	8
x	x^2	$8x$
8	$8x$	64

$y=(x^2+16x+64)+71-64$

$y=(x+8)^2+7$

Vertex $(-8,7)$

$y=3x^2-12x+8$

$y=(3x^2-12x \quad)+8$

$y=3(x^2-4x \quad)+8$

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

$y=3(x^2-4x+4)+8-12$

$y=3(x-2)^2-4$

Because $3\cdot4=12$

Vertex $(2,-4)$