Warmup:

Graph the following quadratic equation:

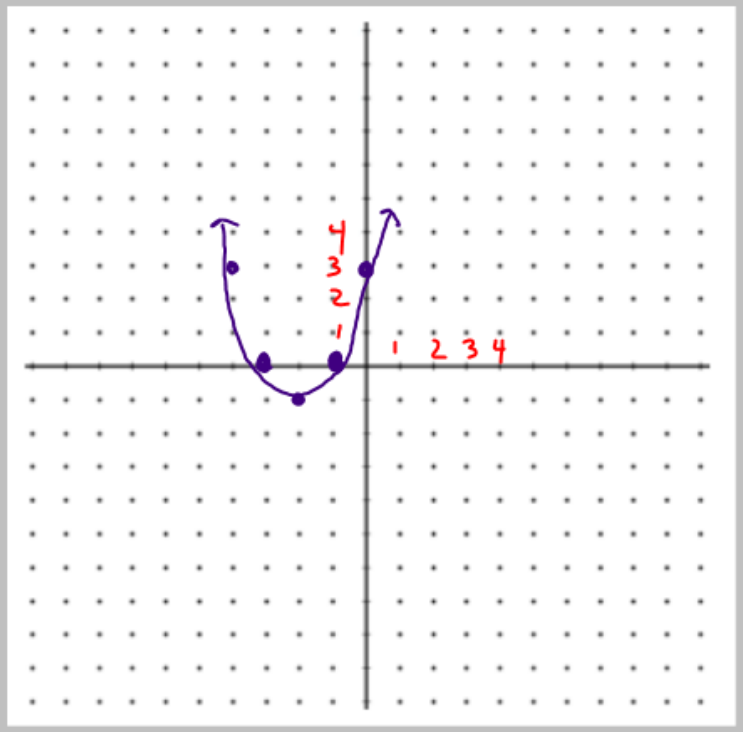
$$y = x^2 + 4x + 3$$

$y = (x+3)(x+1)$

$x = -3$ $\quad$ $x = -1$

x	y
-4	3
-3	0
-2	-1
-1	0
0	3

vertex



$y = x^2 + 4x + 3$

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

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

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

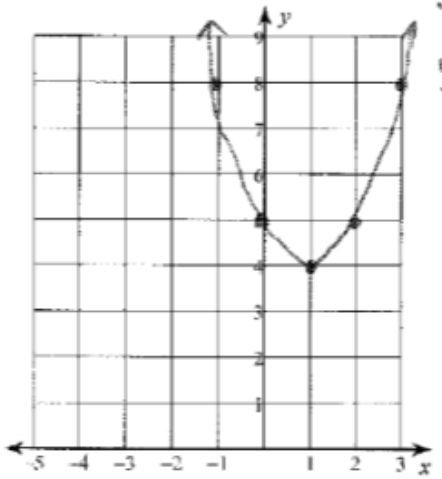
$\frac{-4}{2(1)} = \frac{-4}{2} = -2$

HW #9:

Graphing Quadratic Equations
Answer Key

Sketch the graph of each function.

1) $y = x^2 - 2x + 5$



$y - 5 = x^2 - 2x + 1$
$+1$

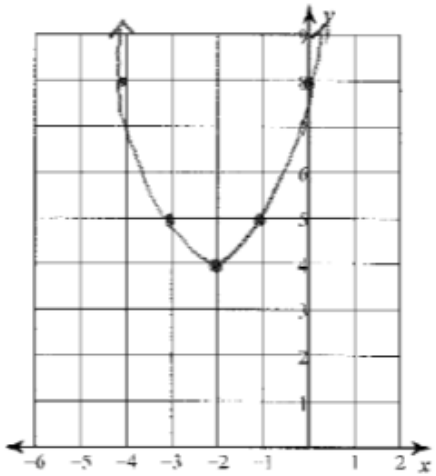
$y - 4 = (x-1)^2$

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

vertex: $(1, 4)$

x	y
-1	8
0	5
1	4
2	5
3	8

2) $y = x^2 + 4x + 8$



$y - 8 = x^2 + 4x + 4$
$+4$

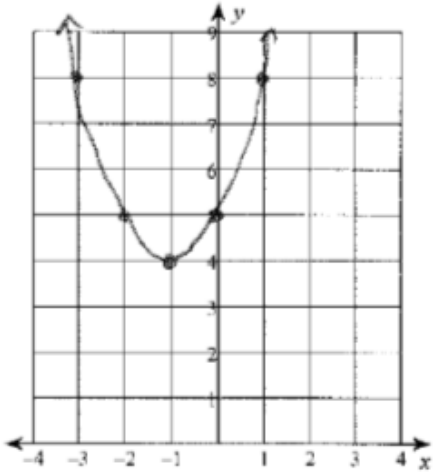
$y - 4 = (x+2)^2$

$y = (x+2)^2 + 4$

vertex: $(-2, 4)$

x	y
-4	8
-3	5
-2	4
-1	5
0	8

3) $y = x^2 + 2x + 5$



$y - 5 = x^2 + 2x + 1$
$+1$

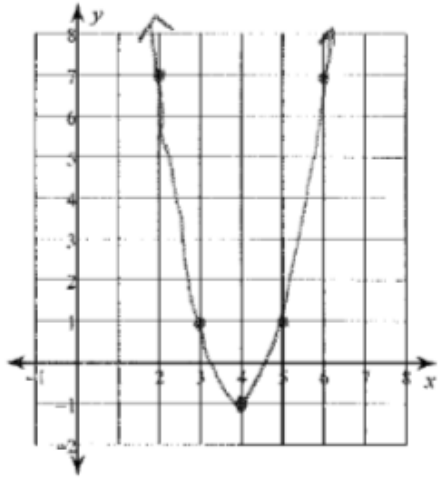
$y - 4 = (x+1)^2$

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

vertex: $(-1, 4)$

x	y
-3	8
-2	5
-1	4
0	5
1	8

4) $y = 2x^2 - 16x + 31$



$y - 31 = 2x^2 - 16x$

$y - 31 = 2(x^2 - 8x \quad)$

$y - 31 = 2(x^2 - 8x + 16)$
$+32$

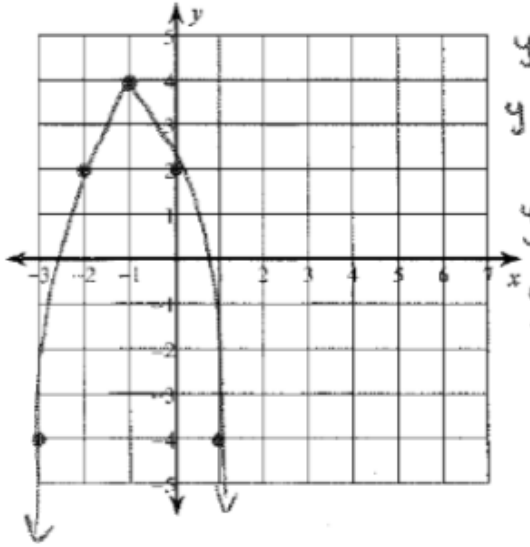
$y + 1 = 2(x-4)^2$

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

vertex: $(4, -1)$

x	y
2	7
3	1
4	-1
5	1
6	7

5) $y = -2x^2 - 4x + 2$



$y - 2 = -2x^2 - 4x$

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

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

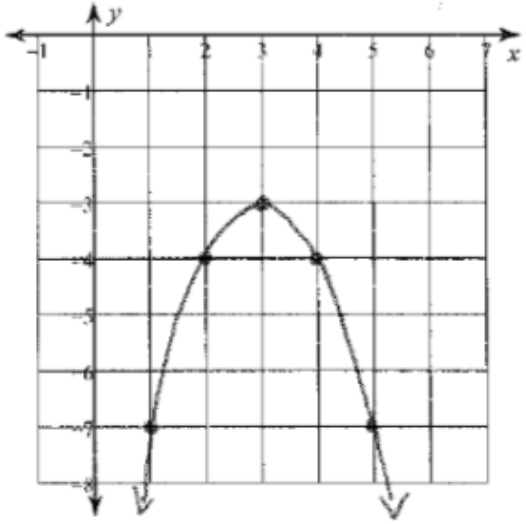
$y - 4 = -2(x+1)^2$

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

vertex : $(-1, 4)$

x	y
-3	-4
-2	2
-1	4
0	2
1	-4

6) $y = -x^2 + 6x - 12$



$y + 12 = -x^2 + 6x$

$y + 12 = -1(x^2 - 6x\ \ )$

$y + 12 = -1(x^2 - 6x + 9)$
$\quad\quad -9$

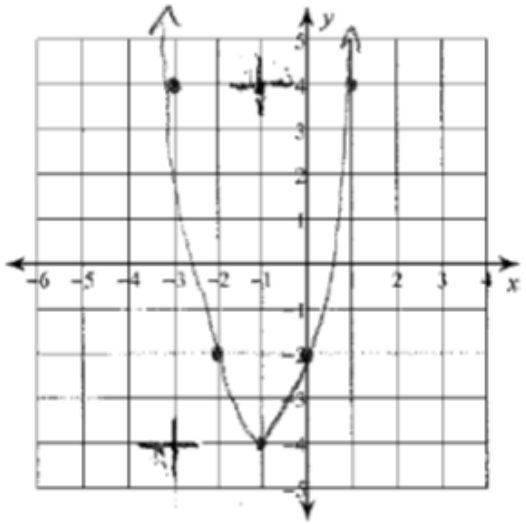
$y + 3 = -1(x-3)^2$

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

vertex : $(3, -3)$

x	y
1	-7
2	-4
3	-3
4	-4
5	-7

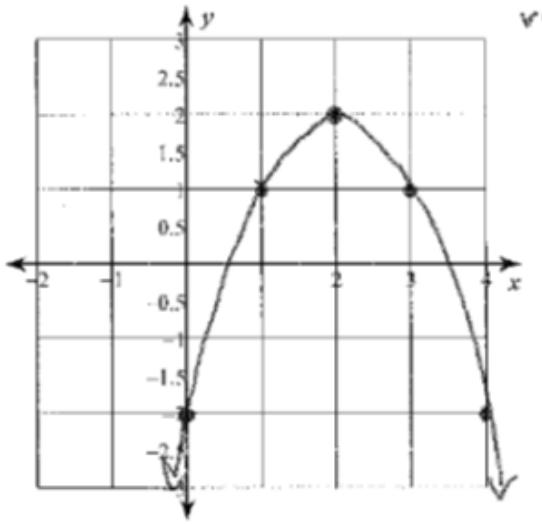
7) $y = 2(x+1)^2 - 4$



vertex: $(-1, -4)$

x	y
-3	4
-2	-2
-1	-4
0	-2
1	4

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

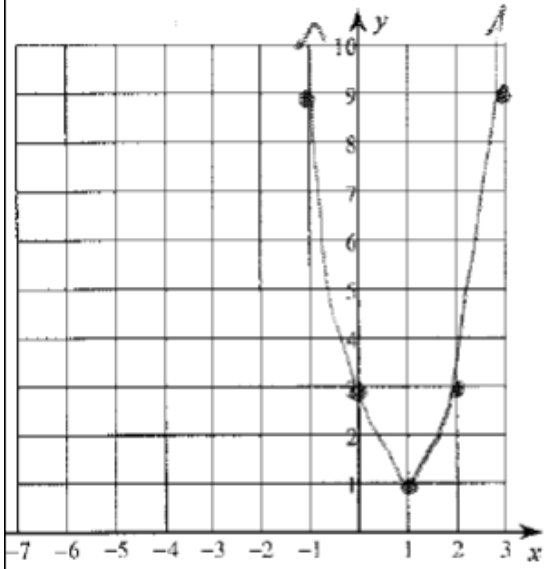


vertex: $(2, 2)$

x	y
0	-2
1	1
2	2
3	1
4	-2

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

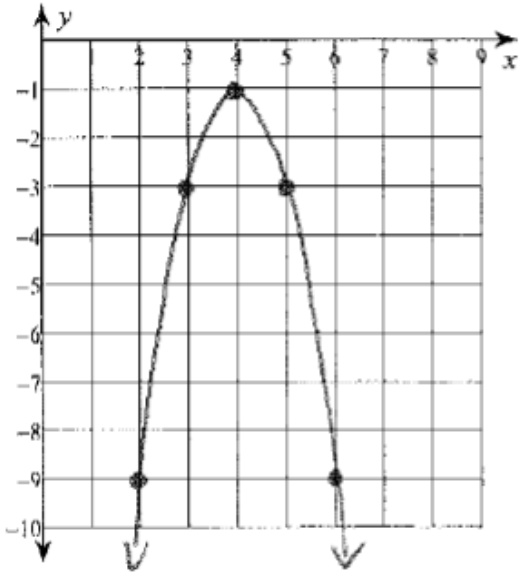
vertex: $(1, 1)$



x	y
−1	9
0	3
1	1
2	3
3	9

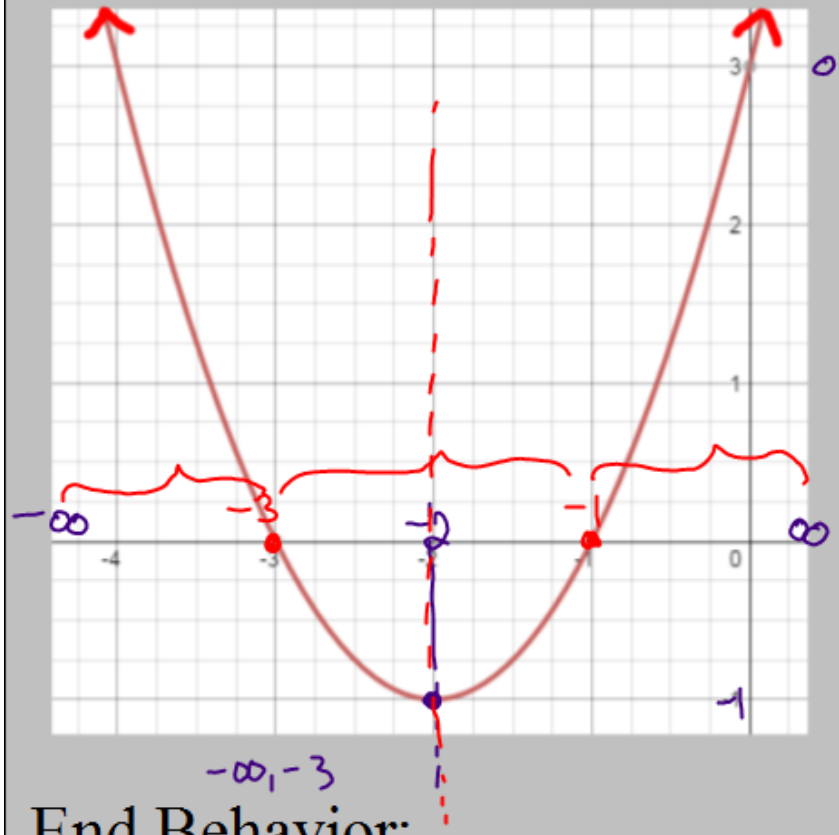
10) $y = -2(x-4)^2 - 1$

vertex: $(4, -1)$



x	y
2	−9
3	−3
4	−1
5	−3
6	−9

$$y = x^2 + 4x + 3$$



* Domain: $(-\infty, \infty)$ Range: $[-1, \infty)$

x-int: -3 & -1 or $(-3,0)$ $(-1,0)$ or $\{-3,-1\}$ y-int: 3 or $(0,3)$

Maximum: N/A Minimum: -1

Intervals of Increase: $(-2, \infty)$ "x"

Intervals of Decrease: $(-\infty, -2)$

Positive Intervals: $(-\infty, -3)$ & $(-1, \infty)$

Negative Intervals: $(-3, -1)$

End Behavior:

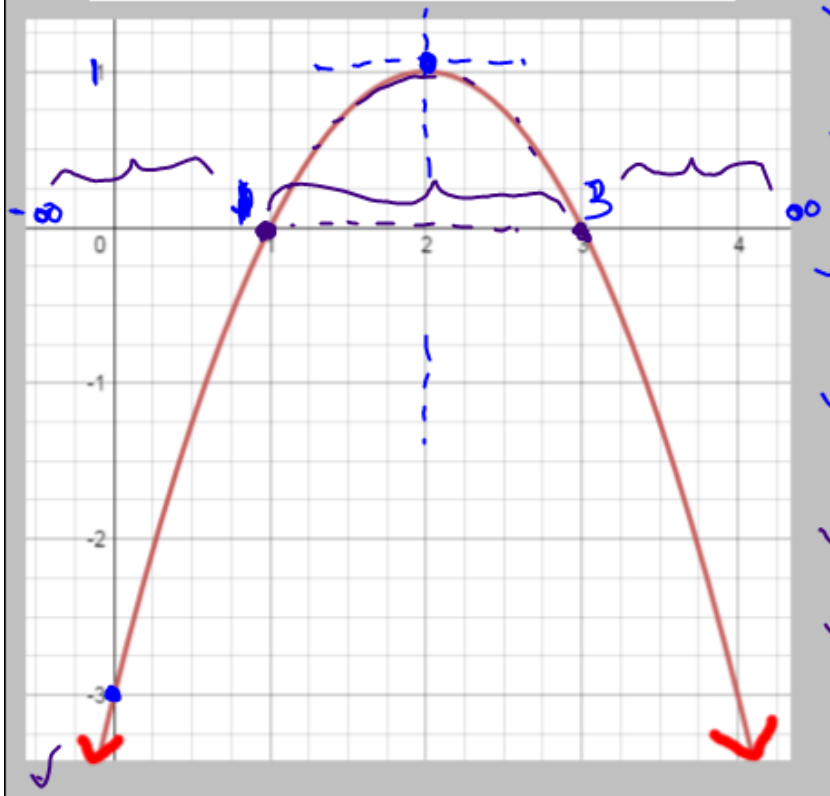
as $x \to -\infty$ $y \to \infty$

as $x \to \infty$ $y \to \infty$

Axis of Symmetry:

$x = -2$

$$y = -x^2 + 4x - 3$$



✓ Domain: $(-\infty, \infty)$ ✓ Range: $(-\infty, 1]$

✓ x-int: $\{1, 3\}$ ✓ y-int: -3

✓ Maximum: 1 ✓ Minimum: N/A

✓ Intervals of Increase: $(-\infty, 2)$

✓ Intervals of Decrease: $(2, \infty)$

✓ Positive Intervals: $(1, 3)$

✓ Negative Intervals: $(-\infty, 1) \cup (3, \infty)$

End Behavior: as $x \to -\infty$ $y \to -\infty$

as $x \to \infty$ $y \to -\infty$

✓ Axis of Symmetry: $x = 2$

Domain: $(-\infty,\infty)$

Range: $(-\infty,\text{max}]$ or $[\text{min},\infty)$

Maximum:

y-coordinate of the vertex

Minimum:

Intervals of Increase:

$(-\infty,$x-coordinate of min/max$)$

$($x-coordinate of min/max$,\infty)$

Intervals of Decrease:

Positive Intervals: ?

Negative Intervals: ?

End Behavior:

As x → -∞ y →

As x →∞ y →

-∞ ∞

-∞ ∞

Axis of Symmetry:

X = x-coordinate of the vertex

shifted left 1
shifted up 3
reflected

(-1, 3)

$y = x^2$

horizontal shift
vertical shift
reflection

(4, 3)

shifted right 4
shifted up 3

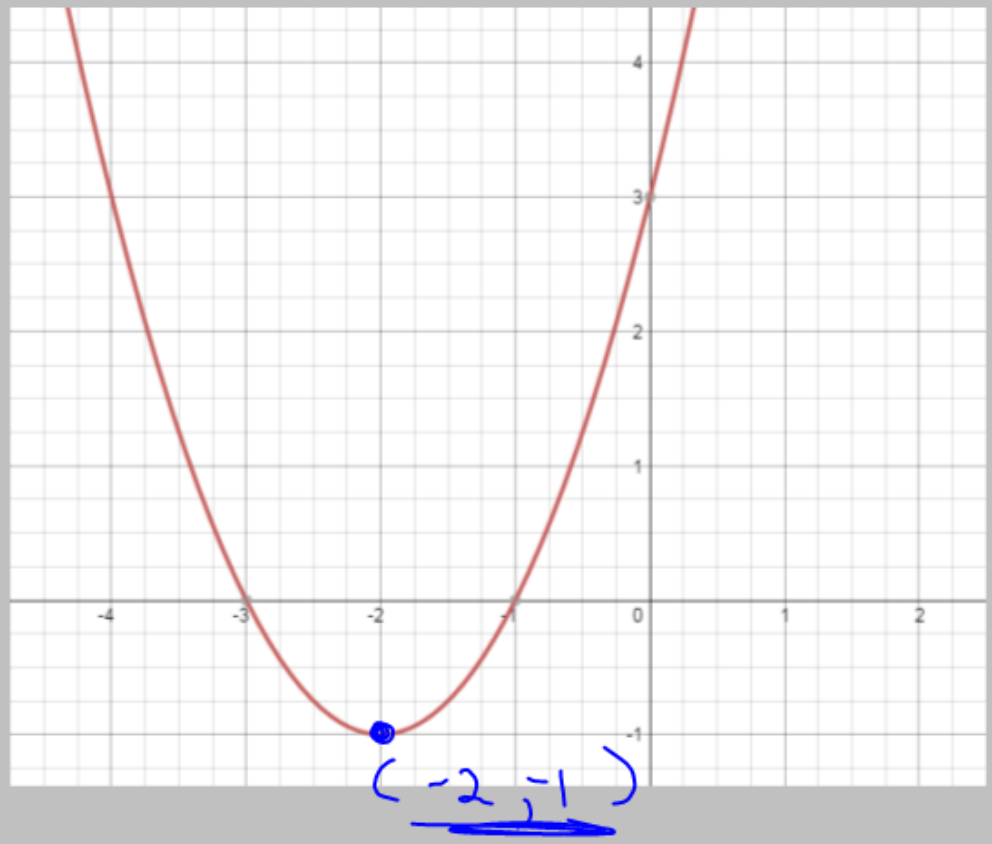
$$y = x^2 + 4x + 3$$

Rewrite the equation in vertex form

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

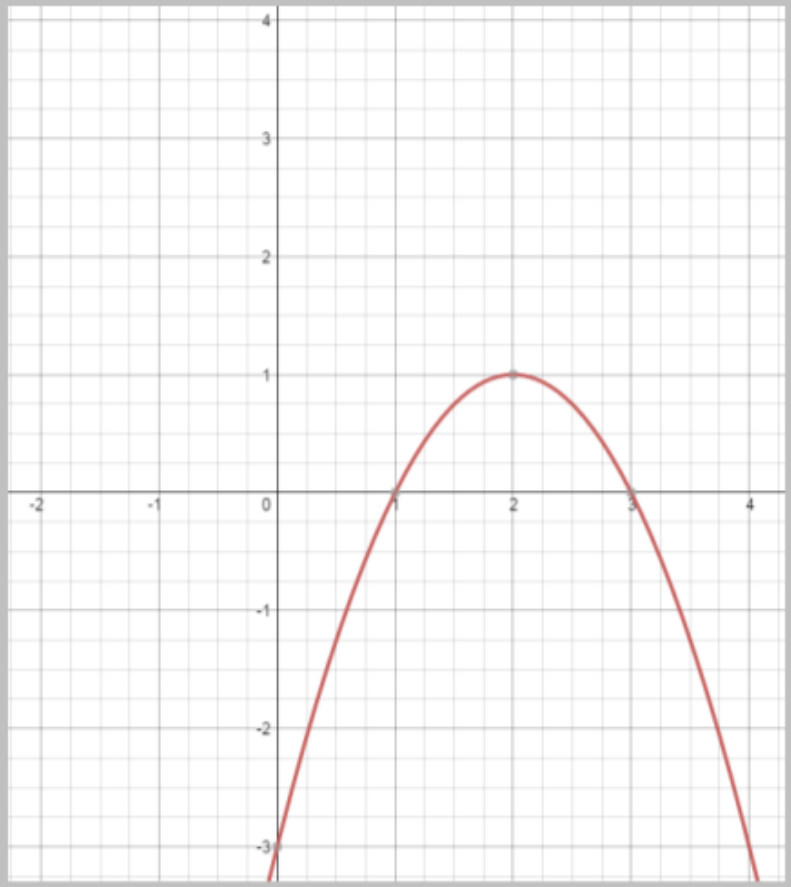
$y = 1(x+2)^2 - 1$

shifted left 2
down 1



$$y = -x^2 + 4x - 3$$

Rewrite the equation in vertex form



- When looking at vertex form, the h and k values determine the **translations** of the quadratic.

- The value of h is the **horizontal translation** and it is inside the parentheses.

-The value of k is the **vertical translation** and it is outside of the parentheses.

- When graphing, think inside is **opposite** of the sign and outside is **the same as** the sign.

Assignment: HW #10:

Graphing Quadratics and Identifying Characteristics

Each quadratic is given to you in factored form today.

Find your vertex, make your table, graph your parabola.

Identify all characteristics of your graph

Go to desmos.com
Click on Launch Calculator
Type in your equation
Verify your graph is correct

Rewrite your equation in vertex form.
Identify the transformations of your graph from the parent function.