Name:_____ Hour: _____ Date: _____

NOTES: Section 4.2 – Graph Quadratic Functions in Vertex or Intercept Form

Goals: #1 - I can graph a quadratic function from vertex form.

#2 - I can graph a quadratic function from intercept form.

#3 - I can take a quadratic in either intercept or vertex form, and rewrite it in standard form.

Homework: Lesson 4.2 Worksheet

Warm Up: Identify the graph's axis of symmetry, vertex, *y*-intercept, whether the graph opens up or down, and its maximum/minimum value. Then graph the function by completing the table.

1. $y = -\frac{3}{4}x^2 - 4x - 1$

AOS: $x = \frac{-8}{3}$ or $-2\frac{2}{3}$

vertex: $(-2\frac{2}{3}, 4\frac{1}{3})$

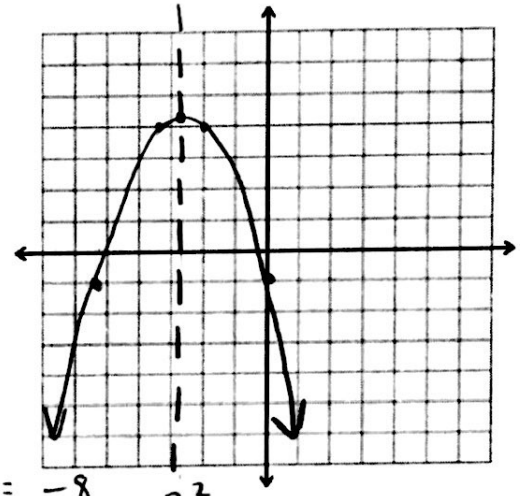
y-int: $(0, -1)$

opens: down

max/min. value: $y = 4\frac{1}{3}$

$x = \frac{-b}{2a} = \frac{-(-4)}{2(-\frac{3}{4})} = \frac{4}{\frac{3}{2}} = -\frac{8}{3} = -2\frac{2}{3}$

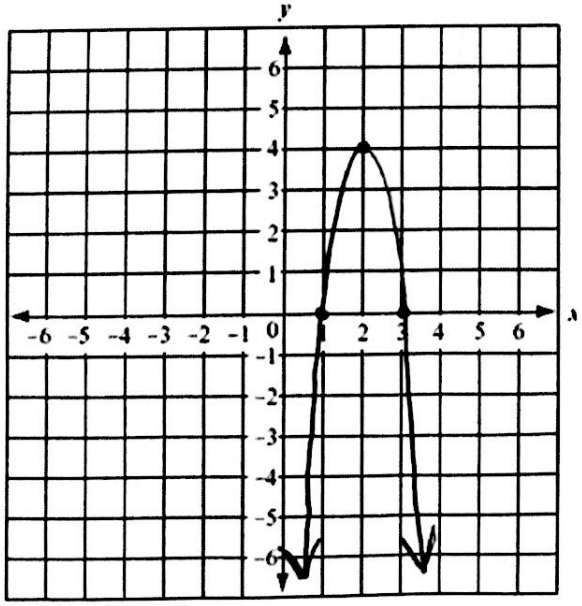
$y = -\frac{3}{4}(-\frac{8}{3})^2 - 4(-\frac{8}{3}) - 1 = \frac{13}{3} = 4\frac{1}{3}$



x	$-5\frac{1}{3}$	$3\frac{1}{3}$	$-2\frac{2}{3}$	-2	0
y	-1	-2	$4\frac{1}{3}$	4	-1

Exploration #1: Graph $-4(x-2)^2 + 4$ using a table of values.

x	*y*
-1	-32
0	-12
1	0
2	4
3	0



1. What is the vertex?

(2, 4)

2. What do you notice about your graph?

Name:_____ Hour:_____ Date:_____

Notes:

We can use the following properties to graph *any* quadratic function in vertex form.

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

- The graph opens up if $a > 0$ (+) and opens down if $a < 0$ (−).
- The graph gets narrower if $|a| > 1$ and wider if $|a| < 1$
- The vertex is (h, k).
- The axis of symmetry is $x = h$

Example #1: Graph $y = -\frac{1}{4}(x + 2)^2 + 5$

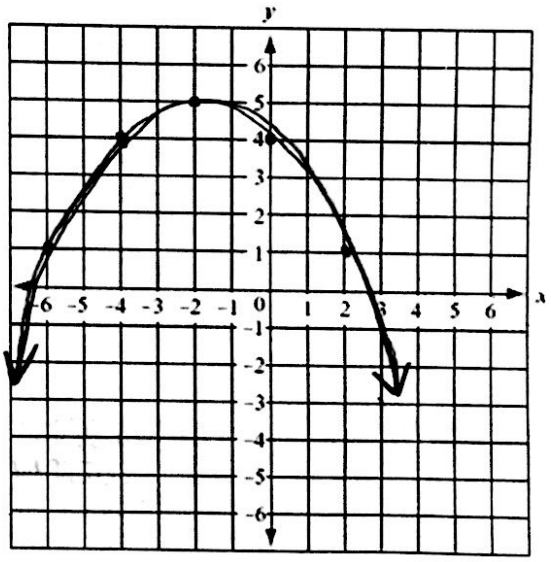
AOS: $x = -2$

Vertex: $(-2, 5)$

y-int: $(0, 4)$

Opens: down

Max/Min. Value: $y = 5$



x	-6	-4	-2	0	2
y	1	4	5	4	1

Work:

Example #2: Tell whether the function $y = (x - 2)^2 + 3$ has a maximum or minimum value. Then find its value.

minimum

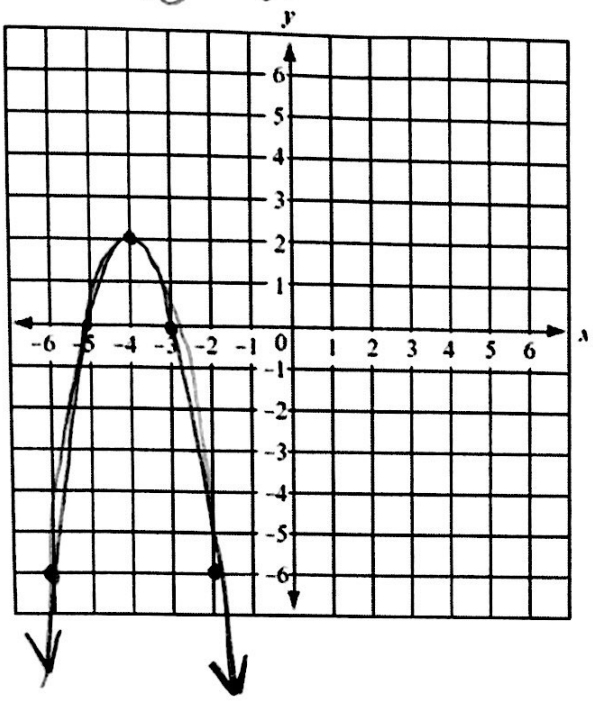
minimum $y = 3$

$(2, 3)$

Name:_____ Hour:_____ Date:_____

Exploration #2: Graph $-2(x+3)(x+5)$ using a table of values.

x	y
-3	0
-2	-6
-1	-16
-4	2
-5	0



1. What are the x-intercepts?
   (-5, 0) (-3, 0)
2. What is the AOS?
   $x = -4$
3. What do you notice about your graph?
   AOS is ½ way between intercepts

Notes:

We can use the following properties to graph *any* quadratic function in intercept form.

$$y = a(x-p)(x-q)$$

- The graph opens up if $a > 0$ (+) and opens down if $a < 0$ (−).
- The graph gets narrower (stretch) if $|a| > 1$ and wider (shrink) if $|a| < 1$
- The x-intercepts are p and q.
- The axis of symmetry is halfway between p and q. It has the equation $x = \frac{p+q}{2}$.

Forms of Quadratic Functions	
Standard Form	$y = ax^2 + bx + c$
Vertex Form	$y = a(x-h)^2 + k$
Intercept Form	$y = a(x-p)(x-q)$

Name:_____ Hour:_____ Date:_____

Example #3: Graph $y = 2(x + 3)(x - 1)$.

$\overline{p}$ $\overline{a}$ x-int: (-3,0) (1,0)

AOS: $x = -1$

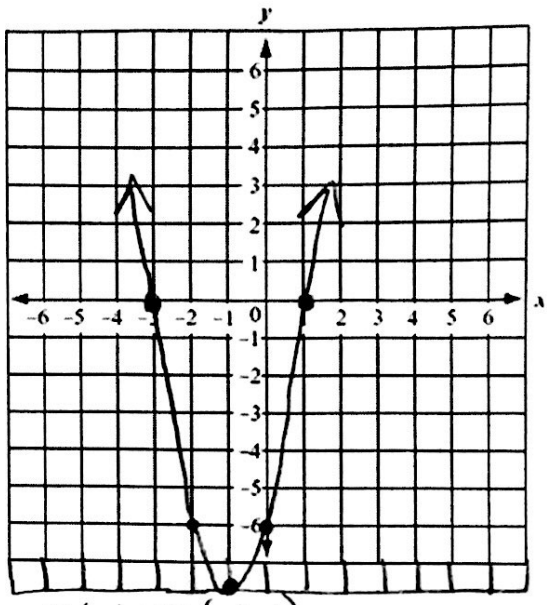
Vertex: $(-1, -8)$

Opens: up

Max./Min. Value: $y = -8$

x	-3	-2	-1	0	1
y	0	-6	-8	-6	0

Work: $x = \frac{p+a}{2} = \frac{-3+1}{2} = \frac{-2}{2} = -1$



$y = 2(-1+3)(-1-1)$
$= 2(2)(-2)$
$= -8$

Example #4: Tell whether the function $y = -4(x + 3)(x + 7)$ has a maximum or minimum value. Then find its value.

max

$x = \frac{p+q}{2} = \frac{-3+-7}{2} = \frac{-10}{2} = -5$

$y = -4(-5+3)(-5+7)$
$= -4(-2)(2) = 16$

maximum

$y = 16$

Example #5: Write the quadratic function in standard form.

1. $y = -2(x + 5)(x - 8)$
$= -2(x^2 - 8x + 5x - 40)$
$= -2(x^2 - 3x - 40)$
$y = -2x^2 + 6x + 80$

2. $y = 4(x - 1)^2 + 9$
$y = 4(x-1)(x-1) + 9$
$y = 4(x^2 - x - x + 1) + 9$
$y = 4(x^2 - 2x + 1) + 9$
$y = 4x^2 - 8x + 13$

3. $y = 2(x + 5)(x + 4)$
$= 2(x^2 + 4x + 5x + 20)$
$= 2(x^2 + 9x + 20)$
$y = 2x^2 + 18x + 40$

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