

Quadratic Functions

Name: _____

Min \rightarrow \uparrow \downarrow \leftarrow Max *Answer Key*

1. The following equations are in Standard Form. Please complete the chart.

Function Remember: $y = a(x-h)^2 + k$	a	h think opposite	k	Vertex (h,k)	Axis of symmetry $X=h$	Range $-$ opens? $-$ k value	Standard form $y = ax^2 + bx + c$	y-intercept let $x=0$	Max/Min y-value (k)
$y = \frac{3}{4}(x-2)^2 + 6$	$\frac{3}{4}$ \uparrow	2	6	(2,6)	$X=2$	$y \geq 6$	$y = \frac{3}{4}x^2 - 3x + 9$	(0,9)	Min 6
$y = -(x-5)^2 - 3$	-1 \downarrow	5	-3	(5,-3)	$X=5$	$y \leq -3$	$y = -x^2 + 10x - 28$	(0,-28)	Max -3
$y = 9(x-\frac{1}{2})^2 + 10$	9 \uparrow	$\frac{1}{2}$	10	($\frac{1}{2}$,10)	$X=\frac{1}{2}$	$y \geq 10$	$y = 9x^2 - 9x + 10.25$	(0,10.25)	Min 10
$y = -2(x+3)^2 + 4$	-2 \downarrow	-3	4	(-3,4)	$X=-3$	$y \leq 4$	$y = -2x^2 - 12x - 14$	(0,-14)	Max 4
$y = 5(x-1)^2$	5 \uparrow	1	0	(1,0)	$X=1$	$y \geq 0$	$y = 5x^2 - 10x + 5$	(0,5)	Min 0
$y = 4x^2 + 6$	4 \uparrow	0	6	(0,6)	$X=0$	$y \geq 6$	$y = 4x^2 + 6$	(0,6)	Min 6
$y = (x-3)^2 - 17$	1 \uparrow	3	-17	(3,-17)	$X=3$	$y \geq -17$	$y = x^2 - 6x - 8$	(0,-8)	Min -17
$y = x^2 - 5$	1 \uparrow	0	-5	(0,-5)	$X=0$	$y \geq -5$	$y = x^2 - 5$	(0,-5)	Min -5
$y = \frac{3}{4}(x+2)^2 + 1$	$\frac{3}{4}$ \uparrow	-2	1	(-2,1)	$X=-2$	$y \geq 1$	$y = \frac{3}{4}x^2 + 3x + 4$	(0,4)	Min 1
$y = -4.9(x-1.5)^2 + 40.2$	-4.9 \downarrow	1.5	40.2	(1.5,40.2)	$X=1.5$	$y \leq 40.2$	$y = -4.9x^2 + 14.7x + 29.175$	(0,29.175)	Max 40.2
$y = x^2$	1 \uparrow	0	0	(0,0)	$X=0$	$y \geq 0$	$y = x^2$	(0,0)	Min 0
$y = (x-2)^2$	1 \uparrow	2	0	(2,0)	$X=2$	$y \geq 0$	$y = x^2 - 4x + 4$	(0,4)	Min 0
$y = -3(x+5)^2 - 4$	-3 \downarrow	-5	-4	(-5,-4)	$X=-5$	$y \leq -4$	$y = -3x^2 - 30x - 79$	(0,-79)	Max -4
$y = \frac{1}{2}(x-8)^2 + 7$	$\frac{1}{2}$ \uparrow	8	7	(8,7)	$X=8$	$y \geq 7$	$y = \frac{1}{2}x^2 - 8x + 39$	(0,39)	Min 7

\textcircled{V}

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

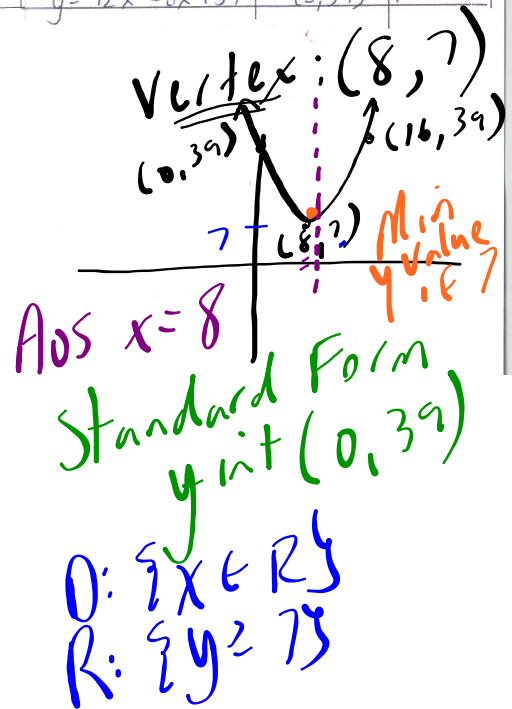
$$y = \frac{1}{2}(x^2 - 16x + 64) + 7$$

\downarrow of parts

$$y = \frac{1}{2}x^2 - 8x + 32 + 7$$

$$y = \frac{1}{2}x^2 - 8x + 39$$

\textcircled{S}



Mr. Hallihan in St. Louis???



Standard --> Vertex Form

NOTES - Standard to Vertex Form.pdf

STANDARD
$$y = ax^2 + bx + c$$

- 'a' value
 - stretch factor
 - direction of opening
- y-intercept

FACTOR

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

- 'a' value
 - stretch factor
 - direction of opening
- vertex
 - A.O.S
 - Domain/Range
 - Max/Min y value
 - Sketch/Graph

We need to FACTOR... 'Complete the Square' Method!!!

S --> V by completing the square

STEPS:

- 1) Factor out the 'a' value from both the x and x² terms [GCF].
- 2) Complete the square on the x term...
 - take half and square it!
 - add this constant within bracket
 - subtract constant outside bracket multiplied by the 'a' value in front.
- 3) **FACTOR** the perfect square trinomial

Note: √First & √Last with sign from middle

VERTEX FORM!!!

EXAMPLE #1...

$$y = x^2 - 6x + 4$$

Perfect Square Trinomial

$$y = (x^2 - 6x + 9) - 9 + 4$$

$$y = (x - 3)^2 - 5$$

√first
middle
√last
vertex (3, -5)

Review... Factoring Simple Trinomials

$x^2 + 8x + 16$

multiply \curvearrowright

$(x + 4)(x + 4)$

add $\overline{\quad}$

$(x + 4)^2$

Perfect Square

$x \rightarrow 16$
 $+ \rightarrow 8$

$4, 4$
 $*$
 same
 Perfect
 Square

More Examples: S → V : Complete the square with "a=1"

#2. $y = x^2 + 14x$

$y = (x^2 + 14x + 49) - 49$

$y = (x + 7)^2 - 49$

y-int (0,0)

Vertex (-7, -49)

#3. $y = x^2 - 8x - 15$

$y = (x^2 - 8x + 16) - 16 - 15$

$y = (x - 4)^2 - 31$

y-int (0, -15)

Vertex (4, -31)

#4. $y = x^2 + 9x + 2$

$y = (x^2 + 9x + \frac{81}{4}) - \frac{81}{4} + 2$

$(\frac{9}{2})^2 = \frac{81}{4}$

$y = (x + \frac{9}{2})^2 - \frac{73}{4}$

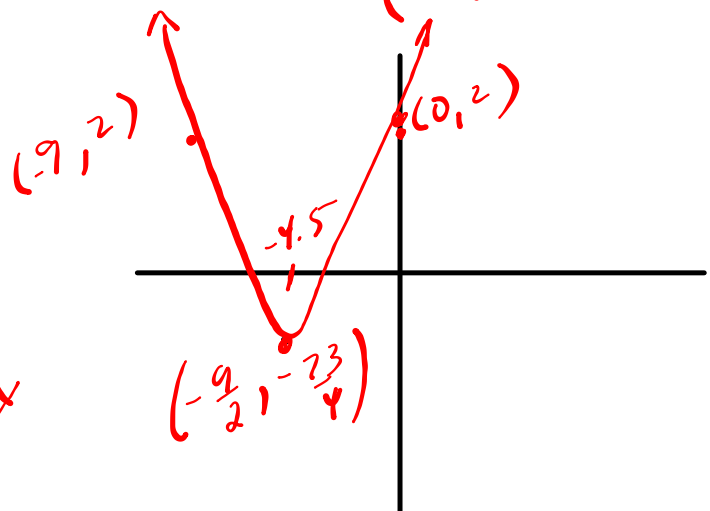
Vertex $(-\frac{9}{2}, -\frac{73}{4})$

D: $\{x \in \mathbb{R}\}$

R: $\{y \geq -\frac{73}{4}\}$

Ao.S ⇒ $x = -\frac{9}{2}$

Min y value of $-\frac{73}{4}$



Your turn... $y_{int}(0, 3)$

⑤ $y = x^2 + 10x + 3$

$y = (x^2 + 10x + 25) - 25 + 3$

$y = (x + 5)^2 - 22$
 vertex $(-5, -22)$


$y = a(x - h)^2 + k$
 $(3/2)^2 = 9/4$

⑥ $y = x^2 - 3x + 5$

$y = (x^2 - 3x + \frac{9}{4}) - \frac{9}{4} + 5$

$y = (x - \frac{3}{2})^2 + \frac{11}{4}$
 vertex $(\frac{3}{2}, \frac{11}{4})$

HOMEWORK

 Worksheet - Standard to Vertex (a = 1).pdf

Do even #'s

Attachments

NOTES - Standard to Vertex Form.pdf

Worksheet - Standard to Vertex ($a = 1$).pdf