

Objectives: You will be able to use the vertex form of a quadratic function.

**Vertex Form of a Quadratic Function:**  
 $f(x) = a(x-h)^2 + k, a \neq 0$

*x* lies *y* tells the truth

• Vertex:  $(h, k)$   
 • Axis of symmetry:  $x = h$  vertical

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Example 1: State the vertex and axis of symmetry for  $f(x) = -\frac{1}{2}(x-2)^2 + 3$ .

V:  $(2, 3)$   
 axis:  $x = 2$

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Example 2: State the vertex and axis of symmetry for  $f(x) = (x+4)^2 - 8$

V:  $(-4, -8)$   
 axis:  $x = -4$

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Recall: Transformation Rules

- Shifts graph up:  $(x)^2 + c$
- Shifts graph down:  $(x)^2 - c$
- Shifts graph right:  $(x - c)^2$
- Shifts graph left:  $(x + c)^2$
- Flips graph upside down:  $-(x)^2$

$f(x) = (x)^2$

x	y
0	0
2	4

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Example 3: Graph  $y = -(x-2)^2 + 3$

upside down  
 right 2  
 up 3

D:  $x > 2$   
 R:  $x < 2$

V:  $(2, 3)$   
 axis:  $x = 2$

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

V:  $(-1, -4)$   
 axis:  $x = -1$

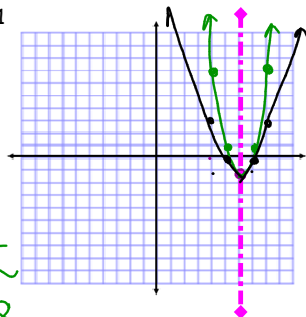
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Example 5: Graph  $y = 2(x - 6)^2 - 1$

$V(6, -1)$   
axis:  $x = 6$



x	y
1	2
2	8



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Example 6: Write the equation of the parabola to the right in vertex form.

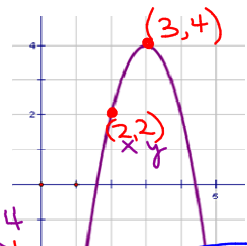
$V(3, 4)$   
upside down

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

$$2 = a(2 - 3)^2 + 4$$

$$2 = a + 4$$

$$-2 = a$$



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

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Example 7: Write the equation of a parabola in vertex form whose vertex is  $(1, 2)$  and passes through the point  $(3, -6)$ .

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

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

$$-6 = a(3 - 1)^2 + 2$$

$$-6 = 4a + 2$$

$$\frac{-8}{4} = \frac{4a}{4} + \frac{2}{4}$$

$$-2 = a$$

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$V(-4, 2)$   
 $(-3, -1)$

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

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

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

$$-1 = a(-3 - 4)^2 + 2$$

$$-1 = a + 2$$

$$-3 = a$$

Sep 20-8:01 AM