

Key

GO #6: Quadratic Functions

Vertex Form: $f(x) = a(x - h)^2 + k$ Standard Form: $f(x) = ax^2 + bx + c$

Converting Quadratic Equations from vertex form into standard form:

Vertex Form: Square the binomial.

$$f(x) = -2(x - 4)^2 + 5$$

$(x-4)(x-4)$ FOIL

$$x^2 - 4x - 4x + 16$$

$$x^2 - 8x + 16$$

Distribute the coefficient of the trinomial..

$$= -2(x^2 - 8x + 16) + 5$$

Combine like terms.

$$= -2x^2 + 16x - 32 + 5$$

Standard Form

$$= -2x^2 + 16x - 27$$

Foil or Box Method

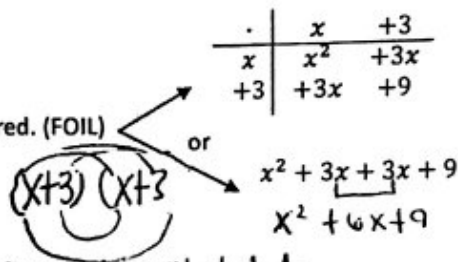
$$\begin{array}{r|l} x & -4 \\ \hline x & x^2 - 4x \\ -4 & -4x + 16 \\ \hline & x^2 - 4x - 4x + 16 \end{array}$$

We have been working with quadratic equations in Vertex Form, $y = a(x - h)^2 + k$. However, it is more common for quadratic equations to be given to us in Standard Form, $y = ax^2 + bx + c$. Today's assignment is for you to practice using FOIL to change equations from Vertex Form into Standard Form. Use the example below to guide your work.

Example:

$$\begin{aligned} y &= -2(x + 3)^2 - 5 \\ y &= -2(x^2 + 6x + 9) - 5 \\ y &= -2x^2 - 12x - 18 - 5 \\ y &= -2x^2 - 12x - 23 \end{aligned}$$

Given.
Multiply the quantity squared. (FOIL)
Distribute the a .
Combine like terms.



Problems:

★ You can check that graphs match! ★

<p>1. $y = 6(x - 4)^2 - 1$ $y = 6(x^2 - 8x + 16) - 1$ $y = 6x^2 - 48x + 96 - 1$ $y = 6x^2 - 48x + 95$</p>	<p>2. $y = \frac{1}{2}(x + 4)^2 + 6$ $y = \frac{1}{2}(x^2 + 8x + 16) + 6$ $y = \frac{1}{2}x^2 + 4x + 8 + 6$ $y = \frac{1}{2}x^2 + 4x + 14$</p>	<p>3. $y = -5(x - 1)^2 + 4$ $y = -5(x^2 - 2x + 1) + 4$ $y = -5x^2 + 10x - 5 + 4$ $y = -5x^2 + 10x - 1$</p>
<p>4. $y = -\frac{1}{3}(x + 6)^2 - 1$ $y = -\frac{1}{3}(x^2 + 12x + 36) - 1$ $y = -\frac{1}{3}x^2 - 4x - 12 - 1$ $y = -\frac{1}{3}x^2 - 4x - 13$</p>	<p>5. $y = 4(x + 2)^2 - 8$ $y = 4(x^2 + 4x + 4) - 8$ $y = 4x^2 + 16x + 16 - 8$ $y = 4x^2 + 16x + 8$</p>	<p>6. $y = -\frac{2}{3}(x - 9)^2 - 2$ $y = -\frac{2}{3}(x^2 - 18x + 81) - 2$ $y = -\frac{2}{3}x^2 + 12x - 54 - 2$ $y = -\frac{2}{3}x^2 + 12x - 56$</p>
<p>7. $y = (x - 2)^2 + 7$ $y = x^2 - 4x + 4 + 7$ $y = x^2 - 4x + 11$</p>	<p>8. $y = (x + \frac{1}{2})^2 - 2$ $y = x^2 + 1x + \frac{1}{4} - 2$ $y = x^2 + x - \frac{7}{4}$</p>	<p>9. $y = 18(x - \frac{1}{3})^2 + 5$ $y = 18(x^2 - \frac{2}{3}x + \frac{1}{9}) + 5$ $y = 18x^2 - 12x + 2 + 5$ $y = 18x^2 - 12x + 7$</p>
<p>10. $y = -2(x + \frac{1}{2})^2$ $y = -2(x^2 + 1x + \frac{1}{4})$ $y = -2x^2 - 2x - \frac{1}{2}$</p>	<p>11. $y = 13(x - 2)^2 + 15$ $y = 13(x^2 - 4x + 4) + 15$ $y = 13x^2 - 52x + 52 + 15$ $y = 13x^2 - 52x + 67$</p>	<p>12. $y = 2(x + 8)^2 + 10$ $y = 2(x^2 + 16x + 64) + 10$ $y = 2x^2 + 32x + 128 + 10$ $y = 2x^2 + 32x + 138$</p>

key

More Vertex Form Worksheet

Using the same processes we developed in "Vertex Form Begun," rewrite each of these quadratic equations.

Expand each quadratic and write in Standard Form. Identify the Vertex for each: (?, ?)
Vertex is at ...

Vertex Form	Standard Form	Vertex is at ...
1. $y = (x+3)^2 - 10$	$y = x^2 + 6x + 9 - 10$ $y = x^2 + 6x - 1$	$(-3, -10)$
2. $y = (x-5)^2 + 4$	$y = x^2 - 10x + 25 + 4$ $y = x^2 - 10x + 29$	$(5, 4)$
3. $y = (x + \frac{2}{3})^2 + \frac{2}{9}$	$y = x^2 + \frac{4}{3}x + \frac{4}{9} + \frac{2}{9}$ $y = x^2 + \frac{4}{3}x + \frac{2}{3}$	$(-\frac{2}{3}, \frac{2}{9})$
4. $y = 2(x+1)^2 - 7$	$y = 2(x^2 + 2x + 1) - 7$ $y = 2x^2 + 4x + 2 - 7$ $y = 2x^2 + 4x - 5$	$(-1, -7)$

Now, take each of these and rewrite in Vertex Form. Then identify the vertex: (?, ?)
Vertex is at ...

Standard Form	Vertex Form	Vertex is at ...
5. $y = x^2 + 8x - 1$	$y = (x+4)^2 - 17$	$\frac{-b}{2a} = \frac{-8}{2} = -4$ $(-4, -17)$
6. $y = x^2 - 6x + 17$	$y = (x-3)^2 + 8$	$\frac{-b}{2a} = \frac{6}{2} = 3$ $(3, 8)$
7. $y = x^2 - 5x - 11$	$y = (x - \frac{5}{2})^2 - \frac{69}{4}$	$\frac{-b}{2a} = \frac{5}{2} = \frac{5}{2}$ $(\frac{5}{2}, -\frac{69}{4})$
8. $y = x^2 + 10x$	$y = (x+5)^2 - 25$	$\frac{-b}{2a} = \frac{-10}{2} = -5$ $(-5, -25)$
9. $y = x^2 + bx + c$	$y = (x + \frac{b}{2})^2 + \frac{b^2 - 2b^2 + 4c}{4}$	$\frac{-b}{2a} = \frac{-b}{2}$ $(\frac{-b}{2}, \frac{b^2 - 2b^2 + 4c}{4})$

★ USE PARENTHESES WITH
NEGATIVES!!!

$$\left(\frac{-b}{2}\right)^2 + b\left(\frac{-b}{2}\right) + c$$

$$\frac{b^2}{4} + \frac{-b^2}{2} + c$$

$$\frac{b^2 - 2b^2 + 4c}{4}$$

teach fraction in calc
+ MATH FRACTION

Worksheet: Standard form, line of symmetry and vertex for quadratic equations

Name: _____ Date: _____

Algebra I
Mr. Chvatal

Key

Practice writing quadratic equations in standard form and identifying a , b and c .

Remember, standard form is $y = ax^2 + bx + c$. highest power to lowest power

Sample #1: $y = -2x + x^2 - 8$

Sample #2: $y = -25 + x^2$

Answer: $y = x^2 - 2x - 8$

Answer: $y = x^2 - 25$ or $y = x^2 + 0x - 25$

$a = 1, b = -2, c = -8$

$a = 1, b = 0, c = -25$

1. $y = x^2 + 3x + 11$ $a = 1$
 $b = 3$
 $c = 11$

2. $y = x^2 - 7x - 11$ $a = 1$
 $b = -7$
 $c = -11$

3. $y = 4x + x^2 - 9$ $a = 1$
 $y = x^2 + 4x - 9$ $b = 4$
 $c = -9$

4. $y = 16 - x + 3x^2$ $a = 3$
 $y = 3x^2 - x + 16$ $b = -1$
 $c = 16$

5. $y = x^2 - 9$ $a = 1$
 $b = 0$
 $c = -9$

6. $y = 2x^2 + 5x$ $a = 2$
 $b = 5$
 $c = 0$

7. $y = -3 - 4x^2$ $a = -4$
 $y = -4x^2 - 3$ $b = 0$
 $c = -3$

8. $y = 6x^2$ $a = 6$
 $b = 0$
 $c = 0$

9. $y = -x^2 - 8 + 6x$ $a = -1$
 $y = -x^2 + 6x - 8$ $b = 6$
 $c = -8$

10. $y = x - x^2$ $a = -1$
 $y = -x^2 + x$ $b = 1$
 $c = 0$