Converting Quadratic Equations between Standard and Vertex Form

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

Convert from Standard Form to Vertex Form:

$y = ax^2 + bx = c \implies y = a(x-h)^2 + k$

know a, b, c want a, h, k

$a = a$

$x = \frac{-b}{2a} = h$

Solve for y $= k$

Substitute the values and rewrite.

$\star X = \frac{-b}{2a}$

Example 1:

$y = 8x^2 - 16x + 27$

We know *a*, *b*, *c* and want *a*, *h*, *k*

$a = 8$ $b = -16$ $c = 27$ ⟸ ***a*** is the coefficient of the x^2 term

$h = x = \frac{-b}{2a} = \frac{-(-16)}{2(8)} = \frac{16}{16} = 1$ ⟸ use the formula to find the value of ***h***

$k = y = 8(1)^2 - 16(1) + 27 = 8 - 16 + 27 = 19$ ⟸ substitute the value found for ***h*** into the original equation and solve for ***k***

$y = 8(x-1)^2 + 19$

Example 2:

$y = 5x^2 - 40x + 67$

We know *a*, *b*, *c* and want *a*, *h*, *k*

$a = 5$ ⟸ ***a*** is the coefficient of the x^2 term

$h = x = \frac{-b}{2a} = \frac{-(-40)}{2(5)} = \frac{40}{10} = 4$ ⟸ use the formula to find the value of ***h***

$k = y = 5(4)^2 - 40(4) + 67 = 80 - 160 + 67 = -13$ ⟸ substitute the value found for ***h*** into the original equation and solve for ***k***

$y = 5(x-4)^2 - 13$

Practice: *Convert the following quadratics from standard to vertex form.*

1. $y = 5x^2 - 10x + 37$
2. $y = 7x^2 + 28x + 19$
3. $y = -2x^2 - 24x - 75$

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

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 Form	Standard Form	Vertex is at . . .
1. $y=(x+3)^2-10$ a= h= k=		
2. $y=(x-5)^2+4$ a= h= k=		
3. $y=(x+\frac{2}{3})^2+\frac{2}{9}$ a= h= k=		
4. $y=2(x+1)^2-7$ a= h= k=		

Now, take each of these and rewrite in Vertex Form. Then identify the vertex: (?, ?) $X = \frac{-b}{2a}$

Standard Form	Vertex Form	Vertex is at . . .
5. $y=x^2+8x-1$ a= b= c=		
6. $y=x^2-6x+17$ a= b= c=		
7. $y=x^2-5x-11$ a= b= c=		
8. $y=x^2+10x$ a= b= c=		
9. $y=x^2+bx+c$ a= b= c=		

Unit 1 Lesson 1 Name_____

1. Convert from standard form to vertex form. 2. Identify vertex and axis of symmetry. (Work on notebook paper & answer in box)

1. $4x^2 + 40x + 3 = 0$
2. $-x^2 + 6x + 4 = 0$
3. $x^2 + 4x + 2 = 0$
4. $-2x^2 + 4x + 11 = 0$
5. $3x^2 - 6x + 8 = 0$
6. $-4x^2 - 24x + 9 = 0$
7. $-x^2 - 10x + 4 = 0$
8. $2x^2 + 20x + 1 = 0$
9. $-x^2 - 2x + 11 = 0$
10. $-3x^2 + 6x - 4 = 0$
11. $-2x^2 + 4x - 5 = 0$
12. $2x^2 - 16x - 3 = 0$
13. $x^2 - 4x + 2 = 0$
14. $3x^2 + 18x + 5 = 0$
15. $4x^2 - 40x - 1 = 0$

Identify 1. axis of symmetry 2. Vertex (Work on notebook paper & answer in box)

1. $5x^2 - 2x - 6 = 0$
2. $-8x^2 + 9x + 4 = 0$
3. $5x^2 + 10x + 2 = 0$
4. $6x^2 + 11x - 12 = 0$
5. $-x^2 + 9x - 6 = 0$
6. $-12x^2 - x + 10 = 0$
7. $7x^2 + 9x - 6 = 0$
8. $8x^2 - 11x - 2 = 0$
9. $-x^2 - 2x + 5 = 0$
10. $-8x^2 + 9x - 1 = 0$
11. $-6x^2 + 11x - 3 = 0$
12. $-4x^2 + x + 2 = 0$
13. $-11x^2 - 9x + 5 = 0$
14. $-2x^2 + 5x + 4 = 0$
15. $x^2 + 6x - 5 = 0$