

Key

Vertex Form of a Quadratic

Standard Form	$y = ax^2 + bx + c$	Note: Can easily see the y-intercept.
Factored Form	$y = a(x-r)(x-s)$	Note: Can easily see roots or "zeros".
Vertex Form	$y = a(x-h)^2 + k$	Note: Can easily see roots or vertex.

$k \neq$ y-intercept

INTERPRETING VERTEX FORM:

Consider: $f(x) = a(x-h)^2 + k$

- The vertex of the parabola is: (h, k) Think $(-h, k)$
- The equation of the axis of symmetry is: $x = h$
- If $a < 0$, the maximum value of the function is: k
neg. \downarrow
- If $a > 0$, the minimum value of the function is: k
pos. \uparrow

Consider: $f(x) = 8(x-3)^2 + 5$

- The vertex of the parabola is: $(3, 5)$ * Be careful w/ sign of h *
min \uparrow
- The equation of the axis of symmetry is: $x = 3$
- The minimum value of the function is: 5
= $a > 0$

To Convert from Standard Form to Vertex Form there are 2 ways:

Example: $2x^2 - 4x + 5$

<p>Method 1: <i>Completing the square</i></p> $2x^2 - 4x + 5 = 0$ $2x^2 - 4x + \underline{\quad} = -5 + \underline{\quad}$ $2(x^2 - 2x + \underline{1}) = -5 + 2(\underline{1})$ $2(x-1)^2 = -3$ $2(x-1)^2 + 3 = y$ <p>* Not Solving, just changing form</p>	<p>Method 2: <i>Find vertex a sub in</i></p> $x = -b/2a = 4/2(2) = 1$ $y = 2(1)^2 - 4(1) + 5$ $= 2 - 4 + 5$ $= 3$ <p>$(1, 3)$ h, k</p> $y = 2(x-1)^2 + 3$ <p>\uparrow \uparrow \uparrow a h k</p>
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To Convert Vertex Form to Standard Form:

Multiply the Binomial and combine like terms

Step 1: Foil the squared binomial.

Step 2: Distribute the "a" to the answer of your squared binomial.

Step 3: Add the "k" to the other constant.

Ex: $3(x-4)^2 - 1$

$$3(x-4)(x-4) - 1$$

$$3(x^2 - 8x + 16) - 1$$

$$3x^2 - 24x + 48 - 1$$

$$= 3x^2 - 24x + 47$$

Convert the Following quadratics from Standard form to Vertex Form:

You must use completing the square for at least 2 of the examples

1. $x^2 + 2x - 2 = 0$

$$x^2 + 2x + \frac{1}{2} = 2 + \frac{1}{2}$$

$\frac{1}{2} \cdot 2 = 1^2 \nearrow$

$$(x+1)^2 = 3$$

$$y = (x+1)^2 - 3$$

2. $2x^2 - 12x + 25 = 0$

$$2x^2 - 12x + \frac{9}{2} = -25 + \frac{9}{2}$$

$$2(x-3)^2 = -7$$

$$y = 2(x-3)^2 + 7$$

3. $x^2 - 12x + 32 = 0$

$$x^2 - 12x + \frac{36}{2} = -32 + \frac{36}{2}$$

$$x^2 - 12x + 36 = -32 + 36$$

$$(x-6)^2 = 4$$

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

4. $3x^2 - 6x + 8 = 0$

$$y = 3(x-1)^2 + 5$$

5. $4x^2 + 16x + 2 = 0$

$$y = 4(x+2)^2 - 14$$

6. $x^2 + 3x + 3 = 0$

$$y = (x+1.5)^2 + .75$$

Vertex to standard form

Change these equations from vertex to standard form.

7. $y = 8(x+1)^2 - 7$

$$8(x+1)(x+1) - 7$$

$$8(x^2 + 2x + 1) - 7$$

$$8x^2 + 16x + 1$$

8. $Y = 6 - (x+3)^2$

$$y = (x+3)^2 + 6$$

$$-1(x+3)(x+3) + 6$$

$$-1(x^2 + 6x + 9) + 6$$

$$-x^2 - 6x - 3$$

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

$$-2(x-1)(x-1) - 4$$

$$-2(x^2 - 2x + 1) - 4$$

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

10. $Y = (x-5)^2 + 19$

$$(x-5)(x-5) + 19$$

$$x^2 - 10x + 25 + 19$$

$$x^2 - 10x + 44$$