

Converting from Standard Form to Vertex Form.

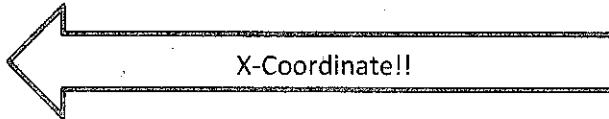
$y = ax^2 + bx + c$ $y = a(x-h)^2 + k$
 $y = 2x^2 - 4x + 9$ to $y = 2(x-1)^2 + 7$
 $a = 2$ $b = -4$ $(1, 7)$

1. Special Part of the Quadratic Formula: $\frac{-b}{2a}$.

(This gives you the x-coordinate for your vertex!)

$y = 2x^2 - 4x + 9$

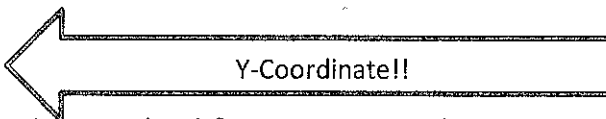
$\frac{-b}{2a} = \frac{-(-4)}{2(2)} = \frac{4}{4} = 1$



2. Plug in x to get y!

$y = 2x^2 - 4x + 9$

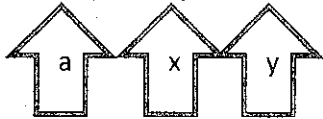
$y = 2(1)^2 - 4(1) + 9 = 7$



3. Steal the "a" Value! $a = 2$ in standard form so it equals 2 in vertex form.

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

(The x-coordinate is always the opposite value!)



Now try these

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

a. $y = 2x^2 - 8x + 7$
 $a = 2$ $b = -8$

① $\frac{-b}{2a} = \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$

② $y = 2(2)^2 - 8(2) + 7$
 $y = -1$

③ $y = 2(x-2)^2 - 1$

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

① $\frac{-b}{2a} = \frac{-(-6)}{2(1)} = \frac{6}{2} = 3$

② $y = (3)^2 - 6(3) + 8$
 $y = -1$

③ $y = 1(x-3)^2 - 1$

c. $y = -2x^2 + 12x + 1$
 $a = -2$ $b = 12$

① $\frac{-b}{2a} = \frac{-12}{2(-2)} = \frac{12}{4} = 3$

② $y = -2(3)^2 + 12(3) + 1$
 $y = 19$

③ $y = -2(x-3)^2 + 19$

Convert between vertex and standard forms of quadratic equations.

Convert from standard form to *vertex* form:Remember: $y = a(x-h)^2 + k$ Let $x = h$ and $y = k$ (x) $h = \frac{-b}{2a}$ to find k , plug the (x) h back into the equation and solve for (y) k .

$$1. y = x^2 + 4x - 1$$

$$a = 1 \quad b = 4$$

$$\textcircled{1} \quad \frac{-b}{2a} = \frac{-4}{2(1)} = \boxed{-2}^h$$

$$\textcircled{2} \quad y = (-2)^2 + 4(-2) - 1$$

$$y = \boxed{-5}^k$$

$$\textcircled{3} \quad y = 1(x - (-2))^2 + (-5)$$

$$\boxed{y = (x + 2)^2 - 5}$$

$$2. y = x^2 - 10x + 10$$

$$\textcircled{1} \quad \frac{-b}{2a} = \frac{-(-10)}{2(1)} = \frac{10}{2} = \boxed{5}^h$$

$$\textcircled{2} \quad y = (5)^2 - 10(5) + 10$$

$$y = \boxed{-15}^k$$

$$\textcircled{3} \quad \boxed{y = (x - 5)^2 - 15}$$

$$3. y = 2x^2 + 10x + 17$$

$$\textcircled{1} \quad \frac{-b}{2a} = \frac{-10}{2(2)} = \frac{-10}{4} = \boxed{-2.5}^h$$

$$\textcircled{2} \quad y = 2(-2.5)^2 + 10(-2.5) + 17$$

$$y = \boxed{4.5}^k$$

$$\textcircled{3} \quad \boxed{y = 2(x + 2.5)^2 + 4.5}$$

$$4. y = -2x^2 + 6x - 3$$

$$\textcircled{1} \quad \frac{-b}{2a} = \frac{-6}{2(-2)} = \frac{-6}{-4} = \boxed{1.5}^h$$

$$\textcircled{2} \quad y = -2(1.5)^2 + 6(1.5) - 3$$

$$y = \boxed{1.5}^k$$

$$\textcircled{3} \quad \boxed{y = -2(x - 1.5)^2 + 1.5}$$

$$5. y = x^2 + 12x + 6$$

$$\textcircled{1} \frac{-b}{2a} = \frac{-12}{2(1)} = -6$$

$$\textcircled{2} y = (-6)^2 + 12(-6) + 6$$
$$y = -30$$

$$\textcircled{3} \boxed{y = (x+6)^2 - 30}$$

$$6. y = 3x^2 - 9x + 18$$

$$\textcircled{1} \frac{-b}{2a} = \frac{-(-9)}{2(3)} = \frac{9}{6} = 1.5$$

$$\textcircled{2} y = 3(1.5)^2 - 9(1.5) + 18$$
$$y = 11.25$$

$$\textcircled{3} \boxed{y = 3(x-1.5)^2 + 11.25}$$

$$7. y = x^2 + 8x + 4$$

$$\textcircled{1} \frac{-b}{2a} = \frac{-8}{2(1)} = -4$$

$$\textcircled{2} y = (-4)^2 + 8(-4) + 4$$
$$y = -12$$

$$\textcircled{3} y = (x-4)^2 - 12$$
$$\boxed{y = (x+4)^2 - 12}$$

$$8. y = 6x^2 - 12x - 18$$

$$\textcircled{1} \frac{-b}{2a} = \frac{-(-12)}{2(6)} = \frac{12}{12} = 1$$

$$\textcircled{2} y = 6(1)^2 - 12(1) - 18$$
$$y = -24$$

$$\textcircled{3} \boxed{y = 6(x-1)^2 - 24}$$