CTS 1

Intro to Completing the Square: Vertex Form

Key

Directions: Write the equation in standard form, ($y = ax^2 + bx + c$), then find the vertex.

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

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

$y = x^2 - 4x - 4x + 16 + 3$

$y = x^2 - 8x + 19$

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

$y = (4)^2 - 8(4) + 19 = 3$

Vertex: (4,3)

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

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

$y = 2(x^2 - 3x - 3x + 9) + 5$

$y = 2x^2 - 12x + 18 + 5$

$y = 2x^2 - 12x + 23$

$x = 12/2(2) = 3$

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

$y = 5$

(3, 5)

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

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

$y = x^2 + 3x + 3x + 9 - 2$

$y = x^2 + 6x + 7$

$x = -6/2 = -3$

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

$y = -2$

(-3, -2)

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

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

$y = 3(x^2 + 4x + 4) - 1$

$y = 3x^2 + 12x + 11$

$x = -12/2(3) = -2$

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

$y = -1$

(-2, -1)

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

$y = (x+1)(x+1) - 4$

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

$y = x^2 + 2x - 3$

$x = -2/2 = -1$

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

$y = -4$ $\boxed{(-1, -4)}$

6. $y = (x-6)^2 - 7$

$y = (x-6)(x-6) - 7$

$y = x^2 - 12x + 29$

$x = 12/2 = 6$

$y = (6-6)^2 - 7 = -7$

$\boxed{(6, -7)}$

7. What do you notice about the vertex for each equation and the way the equation was originally written?

The x-value was the opposite of the # after the x in the parentheses. The y-value was the constant by itself at the end of the equation.

8. Can you find the vertex for this equation without putting it in standard form?

$y = -4(x-5)^2 + 3$

$\boxed{(5, 3)}$

VERTEX FORM:

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

Vertex: (h, k)