I will be able to convert from standard form to vertex form by completing the square

Minds on How do we get to vertex form?

Action! Completing the square investigation

Consolidation What are the steps?
Practice Problems

Minds on

Recall: Different Forms of Quadratic Equations

standard form $\xrightarrow{\text{factor}}$ factored form

$\xleftarrow{\text{expand}}$

$y = ax^2+bx+c$ $\qquad$ $y = a(x-r)(x-s)$

completing the square

vertex form

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

How do we get to/from vertex form?

Action!

6.3 - Completing the Square

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

$$y = 2x^2 + 12x + 21$$

$y = 2(x^2 + 6x) + 21$

$y = 2(x^2 + 6x + 9 - 9) + 21$

$\frac{6}{2} = 3, 3^2 = 9$

$y = 2(x^2 + 6x + 9) + 2(-9) + 21$

$y = 2(x+3)^2 - 18 + 21$

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

vertex $= (-3, 3)$

$$y = -3x^2 + 18x - 22$$

$$y = -3(x^2 - 6x) - 22$$

$$y = -3(x^2 - 6x + 9 - 9) - 22$$

$$\frac{-6}{2} = -3, \quad (-3)^2 = 9$$

$$y = -3(x^2 - 6x + 9) - 3(-9) - 22$$

$$y = -3(x-3)^2 + 27 - 22$$

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

Steps to Completing the Square (Poem)	**Example**
Take "a" out of terms 1 and 2	$2x^2+16x-1$
Leave the guy on the end for now, will do	$2(x^2+8x)-1$
Now take the number in front of the "x"	$\frac{1}{2} of 8 = 4$ and $4^2=16$
Half it, then square it, now add and subtract.	$2(x^2+8x+16-16)-1$
Now we need to move one outside	$2(x^2+8x+16-16)-1$
Multiply by "a", then let it slide	$2(x^2+8x+16)+2(-16)-1$
Inside we now have a Perfect Square	$2(x^2+8x+16)-32-1$
Change to short form…we're almost there!	$2(x+4)^2-32-1$
Add the end numbers and BAM! Your there!	$2(x+4)^2-33$
Pat yourself on the back, you've completed the square. ☺	vertex = (-4, -33)

Examples: Use completing the square to write the following quadratic relations in vertex form:

a) $y = 2x^2 - 12x + 7$

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

$y = 2(x^2 - 6x + 9 - 9) + 7$

$\frac{-6}{2} = -3, \ (-3)^2 = 9$

$y = 2(x^2 - 6x + 9) + 2(-9) + 7$

$y = 2(x-3)^2 - 18 + 7$

$y = 2(x-3)^2 - 11$ vertex $= (3, -11)$

b) $y = -3x^2 - 12x - 11$

$y = -3(x^2 + 4x) - 11$

$y = -3(x^2 + 4x + 4 - 4) - 11$

$\frac{4}{2} = 2,\ 2^2 = 4$

$y = -3(x^2 + 4x + 4) - 3(-4) - 11$

$y = -3(x+2)^2 + 12 - 11$

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

Vertex $= (-2, 1)$

c) $y = 4x^2 - 8x + 1$

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

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

$\frac{-2}{2} = -1, \ (-1)^2 = 1$

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

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

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

Consolidation

Practice: Page 331 #5-7 (you choose), 8, 10, 11, 15