Lesson 8: Connecting the standard form to the vertex form

By the end of this lesson you should be able to:

- Find the vertex form of a quadratic equation in standard form even if it is not factorable, using the partial factoring method

We can use a technique called partial factoring to help us find the axis of symmetry. We can then use this, to find the vertex.
We do this by factoring the standard form as follows:

EXAMPLE 1: Express the standard form in vertex form using partial factoring.
$y = x^2 - 4x - 11$

M: -11 not possible
A: -4
N:

$y = (x)(x - 4) - 11$

In this particular case, you cannot factor fully because there are not 2 numbers that multiply to -11 and add to -4

Factor the first two terms only.

$x = 0$

$x - 4 = 0 + 4$

$x = 4$

Set each partial factor to = 0. These two values will both have a y coordinate of -11 and are the same distance from the axis of symmetry.

Find the axis of symmetry by adding your x values together and dividing by 2

aofs: $\frac{0+4}{2} = \frac{4}{2}$ $\therefore x = 2$

Now, using your x value, find the y value at the vertex.

$x = 2$

$y = (x)(x-4) - 11$

$= (2)(2-4) - 11$

$= (2)(-2) - 11$

$\therefore y = -15$

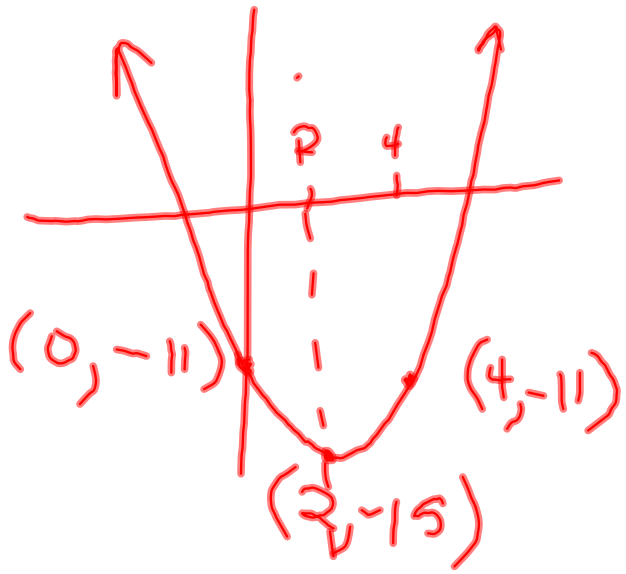
$\therefore$ vertex is $(2, -15)$

Write the equation in vertex form and sketch the parabola

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

$= 1(x-2)^2 - 15$

points: $(0, -11)$, $(4, -11)$ and $(2, -15)$



EXAMPLE 2: use partial factoring to determine the vertex form of $y = 2x^2 - 10x + 11$

$y = (2x)(x-5) + 11$

$(0, 11)$

$(5, 11)$

$\frac{2x}{2} = \frac{0}{2}$ $\quad x - 5 = 0$

$x = 0$ $\quad x = 5$

a of s. $= \frac{0+5}{2}$

$= \frac{5}{2}$

$x = 2.5$

Find y:

$y = 2x(x-5) + 11$

$= 2(2.5)(2.5-5) + 11$

$= 5(-2.5) + 11$

$= -12.5 + 11$

$y = -1.5$

$\therefore$ vertex $(2.5, -1.5)$

$y = 2(x-2.5)^2 - 1.5$

$y = 2(x-2.5)^2 - 1.5$