Day 35: Completing the Square

These two equations make the same graph: $y = -2(x + 1)^2 - 5$ and $y = -2x^2 - 4x - 7$

Which form tells you the vertex? vertex = (−1, −5)

Label each equation with the **form of equation**(standard, factored, or vertex) it is in.

In vertex form, we can see the vertex, and also solve equations with square roots. Today we will learn about changing equations *from* standard form *to* vertex form. These questions and processes will lead you through it.

Is the quadratic below a perfect square? Why or why not?

$y = x^2 + 10x + 25$ Yes

	x	$+5$
x	x^2	$5x$
$+5$	$5x$	25

$(x+5)^2$

What about this one?

$y = x^2 + 6x + 36$ No

	x	3
x	x^2	$3x$
3	$3x$	9

Not 36.

If a quadratic is not a perfect square (like the first one above) we can make it into one using a process called **Completing the Square**. Follow the example below:

Example: Change the function into **vertex form** by *completing the square*: $y = x^2 + 6x + 36$

First, find the number that would make it a perfect square. In other words, *complete the square*: $y = (x^2 + 6x + \underline{9}) + 36$

Next, in order to balance the function, subtract the same number you just added in the step above: $y = (x^2 + 6x + \underline{9}) + 36 - \underline{9}$

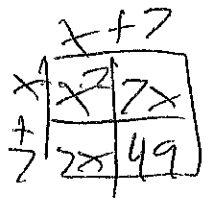
Now, factor the trinomial and then rewrite as a perfect square and combine the remaining numbers: $y = (x + \underline{3})(x + \underline{3}) + 36 - \underline{9}$

$y = (x + \underline{3})^2 + \underline{27}$

Finally, you have **vertex form!*** Vertex = (−3, 27)

Turn the following quadratic functions into vertex form by **completing the square** and then identify its vertex:

1. $y = x^2 + 14x + 52$



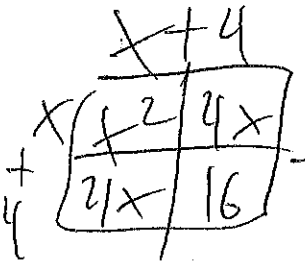
$+3$

$(x+7)^2+3$

vertex form : $(x+7)^2+3$

vertex: $(-7, 3)$

2. $y = x^2 + 8x - 30$

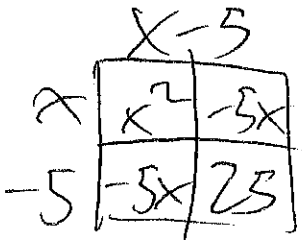


-46

vertex form : $(x+4)^2-46$

vertex: $(-4, -46)$

3. $y = x^2 - 10x + 47$



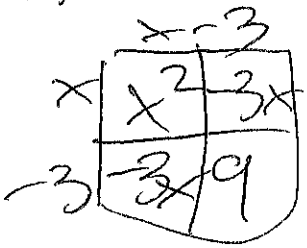
$+22$

$(x-5)^2+22$

vertex form

vertex: $(5, 22)$

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



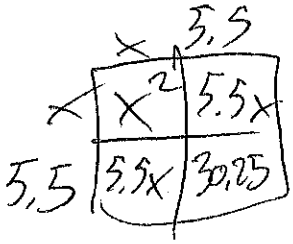
-11

$(x-3)^2-11$

vertex form

vertex: $(3, -11)$

5. $y = x^2 + 11x + 10$

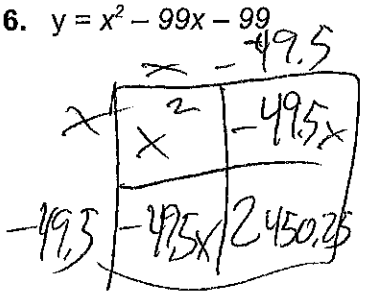


-20.25

vertex form : $(x+5.5)^2-20.25$

vertex: $(-5.5, -20.25)$

6. $y = x^2 - 99x - 99$



-2549.25

vertex form : $(x-49.5)^2-2549.25$

vertex: $(49.5, 2549.25)$