CHAPTER 6 - QUADRATIC EQUATIONS

6.1 - Completing the Square (Max and Min)
Part 1

Objective: Go from standard form to vertex form

$y = ax^2+bx+c \longrightarrow y = a(x-h)^2+k$

Remember what a perfect square trinomial is!!!!

$a^2+2ab+b^2 = (a+b)^2$
or
$a^2-2ab+b^2 = (a-b)^2$

DO IT NOW!

Factor the following:

Rule: $(a+b)^2 = a^2 + 2ab + b^2$
Rule: $(a-b)^2 = a^2 - 2ab + b^2$

1) $x^2+ 4x + 4$

2) $x^2 + 18x + 81$

3) $x^2 - 12x + 36$

Notice: The last term of a perfect square trinomial is half of the middle term squared!!!

and

the factored form is $(x + b/2)^2$

Fill in the blank to make this a perfect square trinomial:

$x^2+ 6x + \_\_\_\_$

To make this a perfect square trinomial we added $(b/2)^2$

6.1 completing the square (part 1)

To go from standard form to vertex form, you must go through the process of completing the square

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

1a Convert the following equation into the vertex form (completing the square)

$y = x^2 + 8x + 5$

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

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

The vertex is:

The axis of symmetry is:

2a Convert the following equation into the vertex form (completing the square)

$y = x^2 + 6x + 3$

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

3 **TRY ON YOUR OWN!**

Convert the following equation into the vertex form (completing the square). Then state the vertex and whether it is a max or min point.

$y = x^2 + 4x + 5$

4a Convert the following equation into the vertex form (completing the square)

$y = x^2 - 12x + 8$ 'b' value is negative

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

6.1 completing the square (part 1)

5a Convert the following equation into the vertex form (completing the square)

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

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

6a Convert the following equation into the vertex form (completing the square)

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

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

6.1 completing the square (part 1)

7a Convert the following equation into the vertex form (completing the square)

$y = -3x^2 + 9x - 13$

Steps to Competing the Square:

1) Put brackets around the first two terms
2) Factor out the common number (not the letter)
3) Look at the last term in the brackets, divide it by 2 and then square it.
4) Add and subtract that term behind the last term in the brackets.
5) Move the negative term outside of the brackets by first multiplying it by the 'a' value.
6) Simplify the terms outside of the brackets.
7) Factor the perfect square trinomial

b What is the vertex and axis of symmetry of the parabola? Is the vertex a max or min point?

Lesson Summary:

- you can rewrite a quadratic relation of form $y = ax^2+bx+c$ in the form $y=a(x-h)^2+k$ by completing the square.

- for a quadratic relation in the form $y=a(x-h)^2+k$, the vertex, (h,k), represents the max or min point of the parabola. If $a>0$, the vertex is a minimum point. If $a<0$, the vertex is a maximum point.

- completing the square is used to find the maximum or minimum point of a quadratic relation that is in standard form.

Classwork / Homework: Pg. 270 # 3aceg, 4, 5, 7ace, 8ace