

DISTANCE LEARNING – ASSIGNMENT #6

This packet is a review of a method to solve quadratic equations known as completing the square. It is very important that you attend class on Tuesday and/or Thursday to help you understand the material, as well as give you the chance to ask any questions.

PART ONE – WHAT IS COMPLETING THE SQUARE?

- This is a method that can be used to solve a quadratic equation that cannot be factored in its original form.
- It is a lengthy process, but very repetitive.
- In all honesty, it is the least used method to solve quadratics.
- You might recognize it, as we used it to create the equations of circles earlier this year.

EXAMPLE 1:

Solve the quadratic equation by completing the square.

$$x^2 + 14x - 38 = 0$$

FIRST: Let's make sure that the x^2 term is positive, and that it is on the same side of the equation as the x -term. Since it is, the first step is to move the constant to the other side of the equation.

$$x^2 + 14x = 38$$

SECOND: Create two blank spaces on each side of the equation that looks like the example below.

$$x^2 + 14x \quad \underline{\hspace{1cm}} = 38 \quad \underline{\hspace{1cm}}$$

THIRD: We will now begin the process of "completing the square." Take the "b" term, which in this case is 14, and divide it by 2, then square it (see below).

$$14/2 = 7^*$$

$$7^2 = 49$$

*I have put a star next to this number because we will need it later. For now, the number highlighted in yellow is the number that will go in the blanks we created in step 2.

$$x^2 + 14x + 49 = 38 + 49$$

FOURTH: You will need to factor the trinomial on the left side, and simplify the addition on the right side.

*REMEMBER the number we started earlier!?! This will help us so we don't have to factor!

Factoring a trinomial looks like $(x +/- \underline{\quad})(x +/- \underline{\quad})$.

That number we started is the number that goes in the blank spaces!

In this case, our equation will now look like

$$(x + 7)(x + 7) = 87$$

Which can also be written as:

$$(x + 7)^2 = 87$$

FIFTH: Now we solve by taking the square root of both sides.

$$x + 7 = \pm 9.33$$

$$x = 9.33 - 7 \text{ AND } x = -9.33 - 7$$

$$x = 2.33 \text{ and } x = -16.33$$

EXAMPLE 2:

Solve the quadratic equation by completing the square.

$$x^2 - 4x + 1 = 5$$

FIRST: Let's make sure that the x^2 term is positive, and that it is on the same side of the equation as the x -term. Since it is, the first step is to move the constant to the other side of the equation.

$$x^2 - 4x = 4$$

SECOND: Create two blank spaces on each side of the equation that looks like the example below.

$$x^2 - 4x \underline{\quad\quad} = 4 \underline{\quad\quad}$$

THIRD: We will now begin the process of "completing the square." Take the "b" term, which in this case is -4, and divide it by 2, then square it (see below).

$$-4/2 = -2^*$$

$$-2^2 = 4$$

*I have put a star next to this number because we will need it later. For now, the number highlighted in yellow is the number that will go in the blanks we created in step 2.

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

FOURTH: You will need to factor the trinomial on the left side, and simplify the addition on the right side.

*REMEMBER the number we starred earlier!?! This will help us so we don't have to factor!

Factoring a trinomial looks like $(x +/- _)(x +/- _)$.

That number we starred is the number that goes in the blank spaces!

In this case, our equation will now look like

$$(x - 2)(x - 2) = 8$$

Which can also be written as:

$$(x - 2)^2 = 8$$

FIFTH: Now we solve by taking the square root of both sides.

$$x - 2 = \pm 2.83$$

$$x = 2.83 + 2 \text{ AND } x = -2.83 + 2$$

$$x = 4.83 \text{ and } x = -.83$$

ASSIGNMENT: Solve each equation by completing the square.

1. $x^2 + 6x - 59 = 0$

2. $x^2 - 12x + 11 = 0$

3. $x^2 - 10x + 26 = 8$

4. $5x^2 = 60 - 20x$