Algebra 1 Unit 9 - Quadratic Equations Notes

b. Are there two possible answers to part (a)? Why or why not?

Day 6 – Solving by Completing the Square

Some trinomials form special patterns that can easily allow you to factor the quadratic equation. We will look at two special cases:

Review: Factor the following trinomials.

1. $x^2 - 6x + 9$	2. $x^2 + 10x + 25$	3. $x^2 - 16x + 64$
$(x-3)(x-3)$ $(x-3)^2$	$(x+5)(x+5)$ $(x+5)^2$	$(x-8)(x-8)$ $(x-8)^2$

(a) How does the constant term in the binomial relate to the b term in the trinomial?

$\frac{b}{2}$ = constant #

$Ax^2 + Bx + C$ $(x + \#)$

(b) How does the constant term in the binomial relate to the c term in the trinomial?

$(\text{constant } \#)^2 = C$ $\sqrt{C}$ = constant #

Problems 1-3 are called **Perfect Square Trinomials**. These trinomials are called perfect square trinomials because when they are in their factored form, they are a binomial squared. An example would be $x^2 + 12x + 36$. Its factored form is $(x + 6)^2$, which is a binomial squared.

But what if you were not given the c term of a trinomial? Let's see if you can find the missing c term!

Directions: Complete the square for the following expressions. Then factor your expression.

a. $x^2 + 4x + \_4\_ = (x + 2)^2$ $\frac{4}{2} = 2$ $2^2 = 4$

b. $x^2 + 8x + \_16\_ = (x + 4)^2$ $\frac{8}{2} = 4$ $4^2 = 16$

c. $x^2 + 6x + \_9\_ = (x + 3)^2$ $\frac{6}{2} = 3$ $3^2 = 9$

d. $x^2 + 14x + \_\_\_\_ = (\quad)^2$

e. $x^2 - 2x + \_\_\_\_ = (\quad)^2$

f. $x^2 - 18x + \_81\_ = (x - 9)^2$ $\frac{-18}{2} = -9$ $(-9)^2 = 81$

hello

g. $x^2 - 12x + \_\_\_\_ = (\quad)^2$

h. $x^2 - 20x + \_100\_ = (x - 10)^2$ $\frac{-20}{2} = -10$ $(-10)^2 = 100$

i. $x^2 + 5x + \_6.25\_ = (x + 2.5)^2$ $\frac{5}{2} = 2.5$ $(2.5)^2$ Listen 6.25 + 0

j. $x^2 - 3x + \_\_\_\_ = (\quad)^2$

k. $x^2 - 7x + \_12.25\_ = (x - 3.5)^2$ $\frac{-7}{2} = -3.5$ $(-3.5)^2 = 12.25$

l. $x^2 + 9x + \_20.25\_ = (x + 4.5)^2$ $\frac{9}{2} = 4.5$ $(4.5)^2 = 20.25$

Mrs. Jackson

Algebra 1 Unit 9 - Quadratic Equations Notes

Solving equations via "COMPLETING THE SQUARE":

The Equation: $x^2+6x+2=0$

STEP 1: move constant term to the other side) $x^2+6x=-2$

STEP 2: make the left hand side a perfect square trinomial by adding $\left(\frac{b}{2}\right)^2$ to **both** sides $x^2+6x+9=-2+9$

STEP 3: factor the left side, simplify the right side $(x+3)^2=7$ (You've completed the square – time to solve!)

STEP 4: solve by finding square roots $\sqrt{(x+3)^2}=\sqrt{7}$

$x+3=\sqrt{7}$ *and* $x+3=-\sqrt{7}$

$x=-3+\sqrt{7}$ *and* $x=-3-\sqrt{7}$

WE SHOULD ONLY USE THE COMPLETING THE SQUARE METHOD IF:

- $a=1$
- _____
- _____

Group Practice: Solve for x.

1. $x^2-6x-72=0$

$x^2-6x+9=72+9$

$(x-3)^2=81$

$x-3=\pm 9$

$x-3=9$ $x-3=-9$

$x=12$ $x=-6$

X = 12, x = -6

2. $x^2+80=18x$

$x^2-18x+80=0$

$x^2-18x=-80$

$x^2-18x+81=-80+81$

$(x-9)^2=1$

$x-9=\pm 1$

$x-9=1$ $x-9=-1$

$x=10$ $x=8$

X = _____

Algebra 1 Unit 9 - Quadratic Equations Notes

3. $x^2 - 14x - 59 = -20$

X = _____

4. $2x^2 - 36x + 10 = 0$

X = _____

5. $x^2 + 6x - 21 = -6$

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

$+21 \quad +21$

$x^2 + 6x + 9 = 15 + 9$

$\sqrt{(x+3)^2} = \sqrt{24}$

$x + 3 = \pm\sqrt{24}$

$24: 8, 3; 4, 2$

$2 \cdot 2 \cdot 3$

$x + 3 = \pm 2\sqrt{6}$

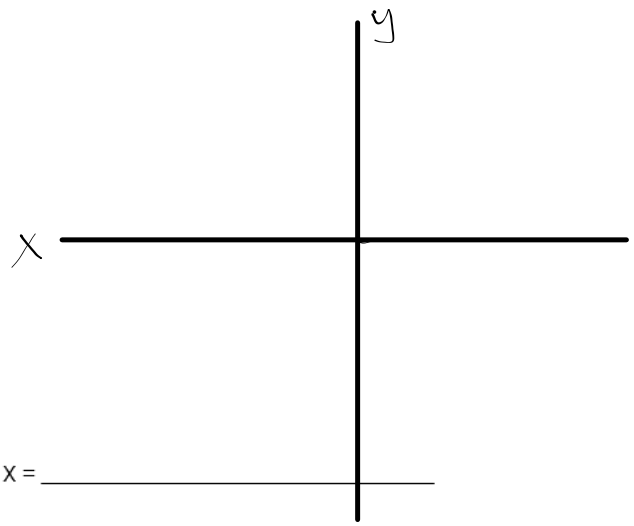
$x + 3 = 2\sqrt{6}$ $\quad -3 \quad -3$

$x = -3 + 2\sqrt{6}$

$x + 3 = -2\sqrt{6}$ $\quad -3 \quad -3$

$x = -3 - 2\sqrt{6}$

6. $x^2 + 12x = -18$



X = _____

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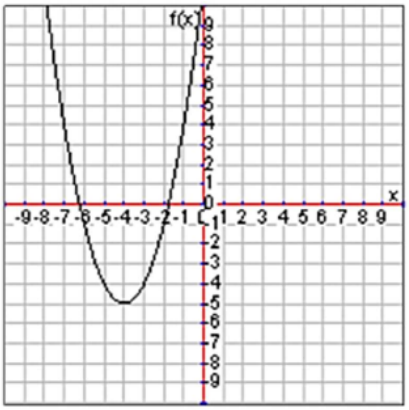
Day 7 – Finding the Vertex by Completing the Square

Think About It: In Unit 8, you learned to find the vertex of an equation in standard form by finding the x-value of the vertex using x = -b/2a. Today, you are going to learn how to use completing the square to find the vertex.

Take a look at the graph and conversion to standard form. How would you go from $g(x) = x^2 + 8x + 11$ to $g(x) = (x + 4)^2 - 5$?

$$g(x) = (x + 4)^2 - 5$$



$$g(x) = (x + 4)^2 - 5$$
$$g(x) = (x + 4)(x + 4) - 5$$
$$g(x) = x^2 + 8x + 16 - 5$$
$$g(x) = x^2 + 8x + 11$$

Vertex: $(-4, -5)$

Finding the Vertex by Completing the Square

To finding the vertex from standard form, we are only going to focus on the right side of the equation. Take a look at the following example from above, but this time, we are going from standard to vertex.

Steps	Reasoning/Justification
$y = x^2 + 8x + 11$	Original Equation
$x^2 + 8x +$ _____ $= -11 +$ _____	Move the constant term to the right side
$x^2 + 8x + 16 = -11 + 16$	Determine the missing "c" term
$(x + 4)^2 = 5$	Simplify the right side and determine the binomial squared on the left side.
$y = (x + 4)^2 - 5$	Move the term on the right back to the other side and set the equation equal to y.
Vertex: (-4, -5)	Name your vertex.