Name: ______________________________________ Date: ___________________

FINDING ZEROES BY COMPLETING THE SQUARE
COMMON CORE ALGEBRA I

In the last lesson, we saw how to find the **zeroes** of a **quadratic function** if it was in **vertex or shifted form**. Do a warm-up problem to refresh this equation solving technique.

***Exercise* #1:** For the quadratic function $y=2(x-2)^2-36$.

(a) Find the zeroes in simplest radical form.

(b) Find the zeroes to the nearest *tenth*.

But, of course, in order for us to find the zeroes using inverse operations as in (a), we need our quadratic in the form $y=a(x-h)^2+k$. In order to do this, we will use our technique of **Completing the Square**.

***Exercise* #2:** Consider the quadratic $y=x^2-6x-16$.

(a) Find the zeroes of this function by factoring.

(b) Find the zeroes of this function by Completing the Square.

Now, it would probably seem to many students a bit redundant to know two methods for finding the zeroes of a quadratic function. Let's illustrate why the technique of **Completing the Square** is important in its own right.

***Exercise* #3:** Let's take a look at the quadratic function $y=x^2+6x+2$.

(a) Find the zeroes of this function using the method of Completing the Square. What kind of numbers are the solutions?

(b) Try to factor x^2+6x+2. Show your guesses and checks.

(c) What can you conclude about zeroes that are found using the **Zero Product Law (Factoring)**?

We now have a variety of tools at our disposal to find the **zeroes** and the **turning points** of quadratic functions. In one case we have the factored form of a quadratic; in a second case we have the vertex form of a quadratic. Each has its advantages and disadvantages.

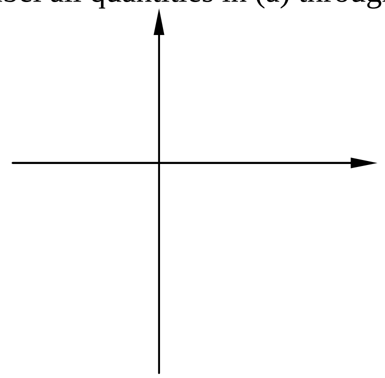
***Exercise* #4:** Let's analyze the quadratic $f(x) = 2x^2 - 4x - 16$, which is written in **standard form**.

(a) Write the function in vertex form and state the coordinates of its turning point.

(b) Using your answer from (a), find the zeroes of the function.

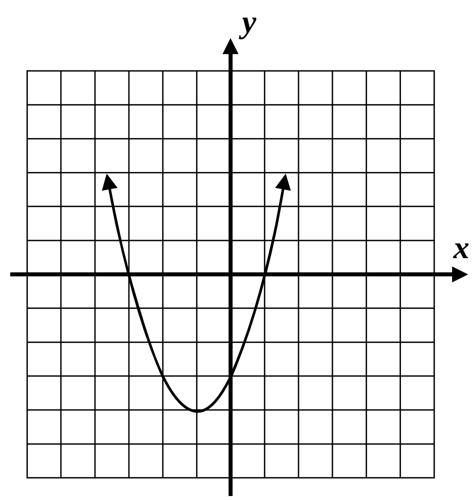
(c) Determine the function's y-intercept.

(d) Draw a rough sketch of the function on the axes below. Label all quantities in (a) through (c).



Let's see if we can now go in the opposite direction.

***Exercise* #5:** The quadratic function pictured has a leading coefficient equal to 1. Answer the following questions based on your previous work.



(a) Write the equation of this quadratic in vertex form.

(b) Write the equation of this quadratic in factored form.

(c) How could you establish that these were **equivalent functions**?

Name: ______________________________ Date: ________________

Finding Zeroes by Completing the Square
Common Core Algebra I Homework

Fluency

1. Solve the equation $x^2 - 4x - 12 = 0$ two ways:

   (a) By Factoring

   (b) By Completing the Square

2. Solve the equation $x^2 + 10x + 21 = 0$ two ways:

   (a) By Factoring

   (b) By Completing the Square

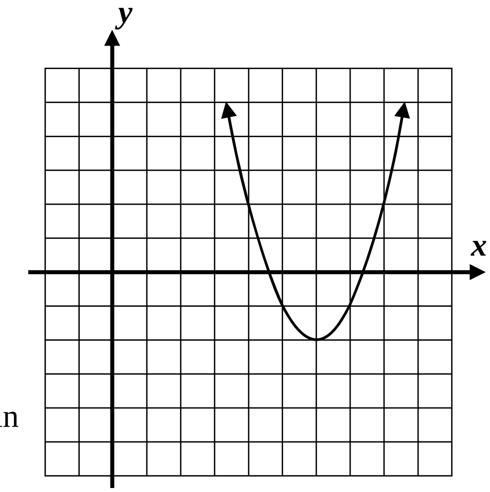
3. Find the solutions to the following equation in simplest radical form by using the technique of Completing the Square.

$$x^2 + 8x - 2 = 0$$

4. Using the Method of Completing the square, find the zeroes of the following function to the nearest *hundredth*.

   $f(x) = 2x^2 + 12x + 5$

5. Consider the quadratic function shown below whose leading coefficient is equal to 1.



(a) Write the equation of this quadratic in $y=(x-h)^2+k$ form.

(b) Find the zeroes of this quadratic in simplest radical form.

(c) Write the equation of this quadratic function in $y=ax^2+bx+c$, i.e. standard, form.

6. Consider the quadratic function $y=x^2+2x-48$ written in standard form.

(a) Write the quadratic function in its vertex form and state the coordinates of its turning point.

(b) Find the zeroes of the function algebraically by setting your equation from (a) equal to zero.

(c) State the range of this quadratic function. Justify your answer by creating a sketch of the function from what you found in (a) and (b).

(d) This quadratic can also be written in equivalent factored form as $y=(x-6)(x+8)$. What graphical features are easy to determine when the function is written in this form?

REASONING

7. Find the zeroes of the function $y=x^2-4x-2$ in simplest radical form. Based on this answer, how do you know that you could not use factoring to find these zeroes?