

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**FINAL WORK WITH QUADRATIC EQUATIONS**  
**N-GEN MATH<sup>®</sup> ALGEBRA I**



*You now have four methods of solving quadratic equations: (1) completing the square, (2) factoring, (3) the quadratic formula, and (4) graphically using technology. Both factoring and the quadratic formula require the equation is **set equal to zero** before using the technique, and this often requires some algebra.*

**Exercise #1:** Solve each of the following quadratic equations using the required method. If needed, arrange the equations so that they are set equal to zero.

(a) Solve by factoring:

$$x^2 + 5x - 12 = 8x - 2$$

(b) Solve by Completing the Square:

$$x^2 - 15x + 24 = -3x + 4$$

(c) Solve using the Quadratic Formula:  
Express answers to the nearest tenth.

$$x^2 - 3x + 16 = 5x + 15$$

(d) Solve using the Quadratic Formula:  
Express answers in simplest radical form.

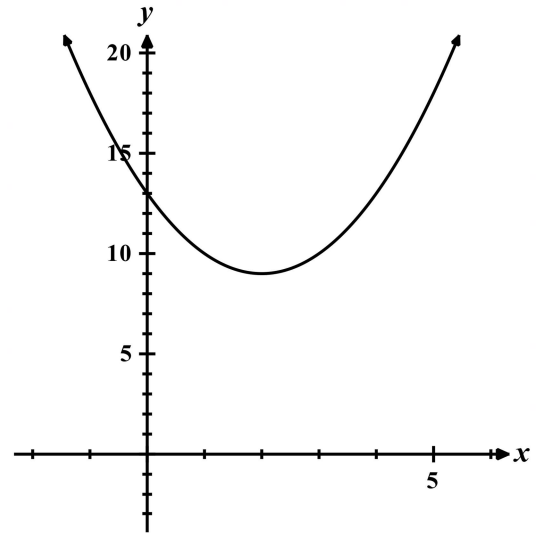
$$x^2 + 4x + 2 = -2x + 7$$



*Some quadratic equations have no solutions that are real numbers at all. We can see why this happens both graphically and when we use the quadratic formula.*

**Exercise #2:** The quadratic function  $y = x^2 - 4x + 13$  is shown graphed below.

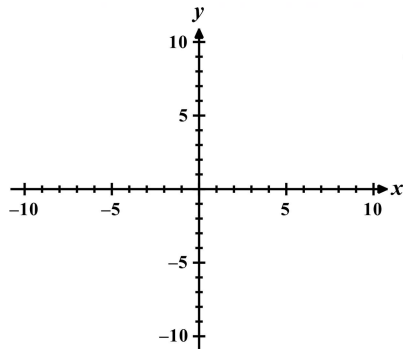
- (a) Explain how the graph shows that the equation  $x^2 - 4x + 13 = 0$  has no solutions.
- (b) What happens when you try to solve  $x^2 - 4x + 13 = 0$  using the quadratic formula? Explain how you can tell this equation has no solutions.



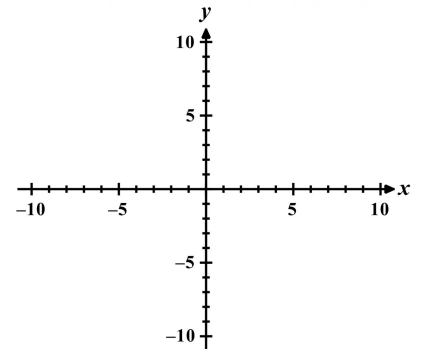
*Whether a quadratic equation has any real solutions depends on whether the expression under the square root,  $b^2 - 4ac$ , is negative. If it is negative, no real solutions can be found. This expression is known as the **discriminant** of the quadratic.*

**Exercise #3:** For each quadratic equation shown below, use the value of the **discriminant**,  $b^2 - 4ac$ , to determine if it has any real solutions. Verify by sketching a graph using the standard window.

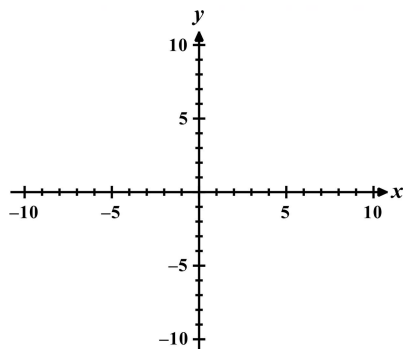
(a)  $x^2 - 10x + 22 = 0$



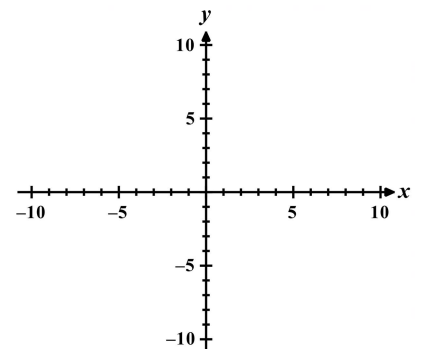
(b)  $x^2 + 6x + 11 = 0$



(c)  $-x^2 + 2x - 2 = 0$



(d)  $-2x^2 - 4x + 7 = 0$



Name: \_\_\_\_\_

Date: \_\_\_\_\_

**FINAL WORK WITH QUADRATIC EQUATIONS**  
**N-GEN MATH<sup>®</sup> ALGEBRA I HOMEWORK**

**FLUENCY**

1. Solve each of the following equations using the given method. Place your final answers in the form asked for.

(a) Solve by factoring:  
(Answers are exact)

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

(b) Solve by factoring:  
(Answers are exact)

$$2x^2 + 5x + 3 = x^2 + 9x + 15$$

(c) Solve by completing the square:  
(Round answers to the nearest *tenth*)

$$x^2 + 10x + 2 = 2x + 5$$

(d) Solve using the quadratic formula:  
(Express answers in simplest radical form)

$$2x^2 + 3x - 3 = -3x - 4$$

2. Which of the following sets represents the zeros of the function  $f(x) = x^2 - 4x + 2$ ?

(1)  $\{-1, 2\}$

(2)  $\{2 - 2\sqrt{2}, 2 + 2\sqrt{2}\}$

(3)  $\{2 - \sqrt{2}, 2 + \sqrt{2}\}$

(4)  $\{-1, 4\}$



3. Calculate the discriminant,  $b^2 - 4ac$ , for each of the following quadratic equations. Then, based on its value, state whether the equation has any real zeros. You do not need to determine the value of the zeros.

(a)  $x^2 - 12x + 32 = 0$

(b)  $x^2 + 8x + 41 = 0$

(c)  $2x^2 - 12x + 11 = 0$

(d)  $5x^2 - 10x - 7 = 0$

(e)  $-x^2 + 14x - 57 = 0$

(f)  $3x^2 + 24x + 50 = 0$

## APPLICATIONS

4. The percent of popcorn kernels that will pop,  $P$ , is modeled using the equation:

$$P = -0.002T^2 + 1.7T - 280, \text{ where } T \text{ is the oil temperature in degrees Fahrenheit.}$$

Determine the two oil temperatures, to the nearest degree Fahrenheit, that result in zero percent of the kernels popping. Show the method/work you use to find your answers.

## REASONING

5. Given the function  $y = x^2 - 6x + c$ , where  $c$  is some unknown constant, use your calculator to experiment and find the smallest integer value of  $c$  for which this function has no real zeros.

(a) Sketch a graph of your function.

(b) State the value of the quadratic's discriminant.

