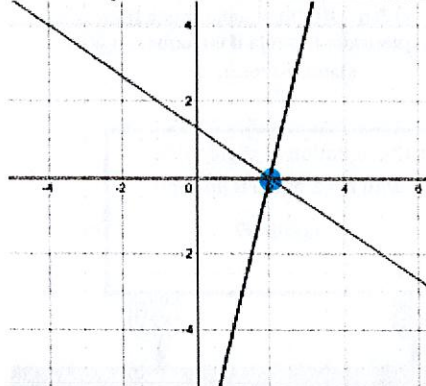
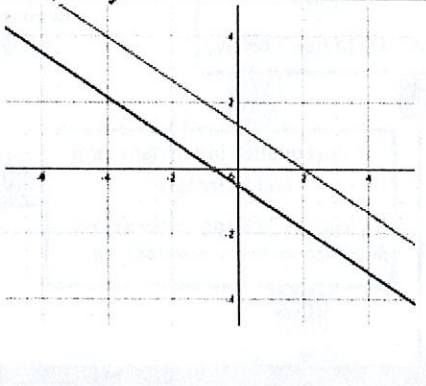
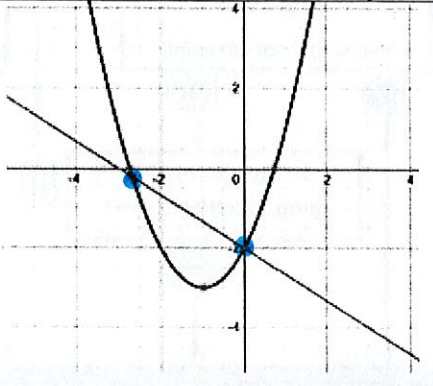


# 4.6 Systems with Quadratics

Activator: *Harmony of Functions Diagnostic*

<p>1. Is there a point of intersection on the following graph? If so, what is that point? If not, why?</p>	<p>2. Is there a point of intersection on the following graph? If so, what is that point? If not, why?</p>	<p>3. Is there a point of intersection on the following graph? If so, what is that point? If not, why?</p>
		
<p>Yes, the POI is at (2,0).</p>	<p>No, the two lines are parallel and therefore do not intersect.</p>	<p>Yes, there are <u>two</u> POI at approximately (0,-2) and (-2.7,-0.3).</p>

Explore: *Solving Systems of Quadratic & Linear Equations Desmos Activity*

Record your systems to Slides 9-12 below.

**Answers will vary.**  
**Examples given below:**

<p>Create a system using one Quadratic equation and one linear equation with exactly one solution.</p> $\begin{cases} y = (x+3)^2 + 1 \\ y = 1 \end{cases}$ <p style="text-align: center;">Slide 9</p>	<p>Create a system using two quadratic equations with exactly one solution.</p> $\begin{cases} y = x^2 \\ y = -x^2 \end{cases}$ <p style="text-align: center;">Slide 10</p>	<p>Create a system using one Quadratic equation and one linear equation with exactly two solutions.</p> $\begin{cases} y = x^2 - 4 \\ y = 2x + 1 \end{cases}$ <p style="text-align: center;">Slide 11</p>	<p>Create a system using two quadratic equations with exactly two solutions.</p> $\begin{cases} y = (x-2)^2 - 2 \\ y = -(x-2)^2 + 2 \end{cases}$ <p style="text-align: center;">Slide 12</p>
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In order to solve these systems algebraically, we must review solving equations.



# Solving Quadratic Equations

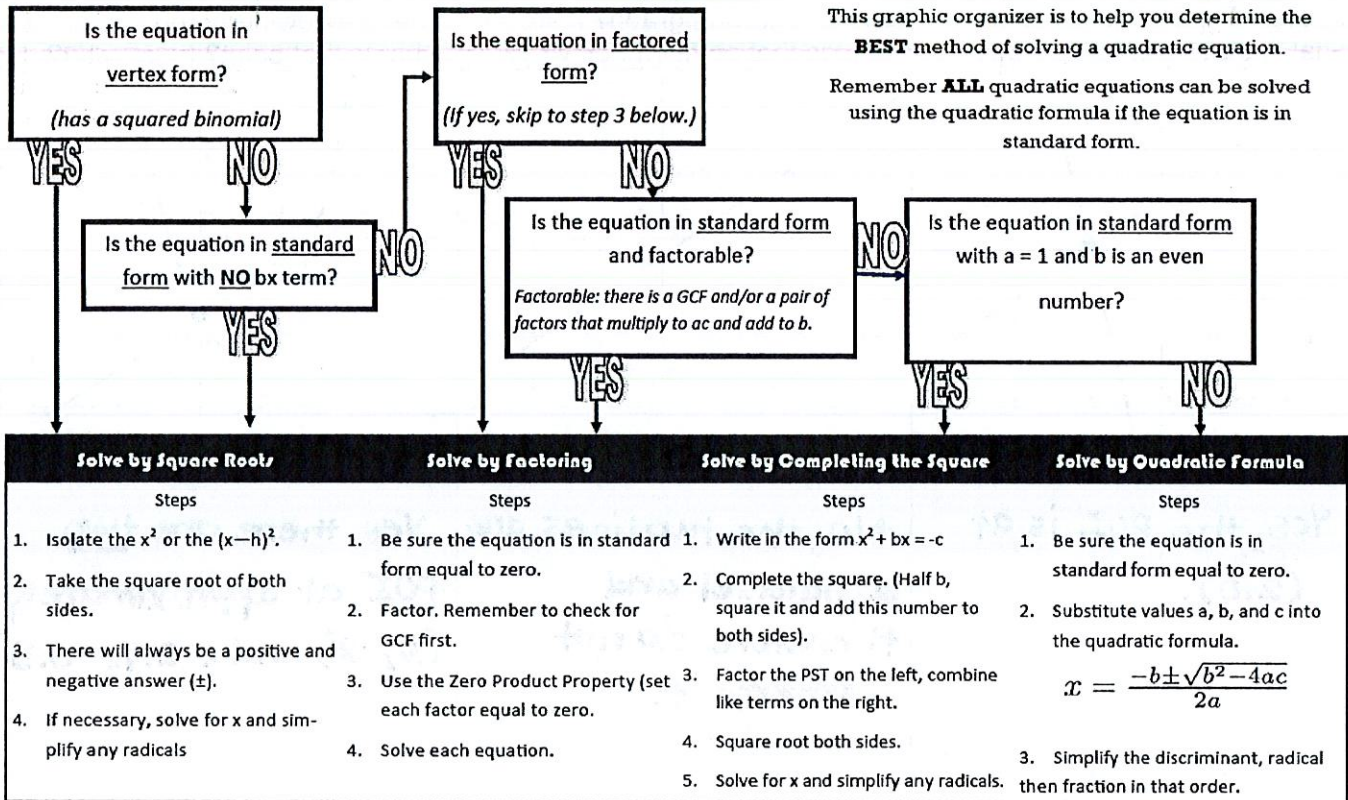
## Graphic Organizer

The three forms of a Quadratic Equation are :

- 1 Standard Form  $ax^2 + bx + c = 0$
- 2 Vertex Form  $a(x-h)^2 + k = 0$
- 3 Factored Form  $a(x-p)(x-q) = 0$

This graphic organizer is to help you determine the **BEST** method of solving a quadratic equation.

Remember **ALL** quadratic equations can be solved using the quadratic formula if the equation is in standard form.



Practice:

4. Solve the system using substitution method. State the solution(s) as ordered pairs.

$$\begin{cases} x + y = 5 \\ y + 1 = 3x^2 + 2x \end{cases} \rightarrow y = -x + 5 \text{ solve for } y \text{ in linear eq.}$$

$$-x + 5 + 1 = 3x^2 + 2x$$

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

$$+x - 6 \quad +x - 6$$

$$0 = 3x^2 + 3x - 6$$

$$0 = 3(x^2 + x - 2)$$

$$0 = 3(x+2)(x-1)$$

$$x+2=0 \quad x-1=0$$

$$x = -2 \quad x = 1$$

substitute into the quadratic eq

set equation = 0  
(try to keep a positive)

Solve the quadratic equation by best method

The solutions are  $(-2, 7)$  and  $(1, 4)$ .

$$y = -(-2) + 5 \quad y = -1 + 5$$

$$y = 7 \quad y = 4$$

Substitute  $x$ 's into one of original eq to find  $y$ 's.

5. Solve the system using substitution method. State the solution(s) as ordered pairs.

$$\begin{cases} y = x^2 + 5x - 2 \\ y = 3x - 2 \end{cases}$$

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

$$-3x + 2 \quad -3x + 2$$

$$0 = x^2 + 2x$$

$$0 = x(x+2)$$

$$x = 0 \quad x + 2 = 0$$

$$x = -2$$

$$y = 3(0) - 2$$

$$y = -2$$

$$y = 3(-2) - 2$$

$$y = -8$$

The solutions are  $(0, -2)$  and  $(-2, -8)$ .

# PRACTICE!

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

## Solving Quadratics 4 by 4

**Directions:** For each level, you will have four quadratic equations to solve. You must give the **exact solutions** to all four of the questions in the boxes provided. You must use each of the following algebraic solving methods for each level 1) factoring 2) square roots 3) completing the square and 4) quadratic formula.

In the box next to the level, the **sum** of the real solutions and the real parts of the complex solutions for all four problems are listed.

Level One Beginner		-2.33	Level Two Intermediate		12.67
Method: <b>FACTORING</b> $x^2 - 4x - 77 = 0$ $(x-11)(x+7) = 0$ $x-11=0 \quad x+7=0$ $x=11 \quad x=-7$	Method: <b>SQUARE ROOTS</b> $2x^2 = 32$ $2x^2 - 32 = 0$ $\frac{2x^2}{2} = \frac{32}{2}$ $x^2 = 16$ $\sqrt{x^2} = \pm\sqrt{16}$ $x = \pm 4$		Method: _____ $4x^2 + 25 = 0$	Method: _____ $18x^2 = 50$	
Method: <b>COMPLETING THE SQUARE</b> $x^2 + 8x - 29 = 0$ $+29 \quad +29$ $x^2 + 8x + 16 = 29 + 16$ $\frac{8}{2} = 4 \quad 4^2 = 16$ $(x+4)^2 = 45$ $\sqrt{(x+4)^2} = \pm\sqrt{45}$ $x+4 = \pm 3\sqrt{5}$ $x = -4 \pm 3\sqrt{5}$	Method: <b>QUADRATIC FORMULA</b> $3x^2 - 5x - 1 = 0$ $a=3 \quad b=-5 \quad c=-1$ $x = \frac{5 \pm \sqrt{(-5)^2 - 4(3)(-1)}}{2(3)}$ $x = \frac{5 \pm \sqrt{37}}{6}$ $x = \frac{5 + \sqrt{37}}{6} \quad \& \quad \frac{5 - \sqrt{37}}{6}$		Method: _____ $3x^2 - 2x = 6$	Method: _____ $x^2 - 12x - 5 = 16$	

$x = -4 + 3\sqrt{5} \quad \& \quad -4 - 3\sqrt{5}$