$\frac{-b}{2a}$

Algebra 2 4.2

Solve quadratic equations by graphing

Estimate solutions of quadratic equations by graphing

quadratic function

quadratic equation

standard form → $ax^2+bx+c=0$

zero(s)

root(s)

no solution

double root

whiteboards?

Toothpick & curve

The zeros of the function are the x-intercepts of its graph.

Quadratic Function

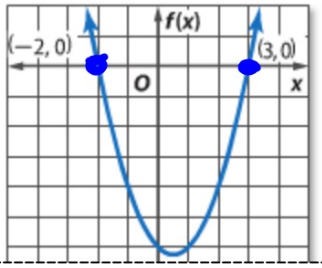
$f(x) = x^2 - x - 6$

$f(-2) = (-2)^2 - (-2) - 6$ or 0

$f(3) = 3^2 - 3 - 6$ or 0

−2 and 3 are zeros of the function.

Graph of Function



-6, -3, 2, -1

$x^2 - x - 6 = 0$

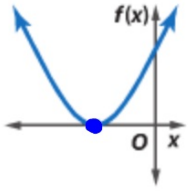
$(x-3)(x+2) = 0$

$x - 3 = 0$ $\quad x + 2 = 0$

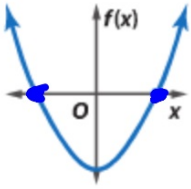
KeyConcept Solutions of a Quadratic Equation

Words A quadratic equation can have one real solution, two real solutions, or no real solutions.

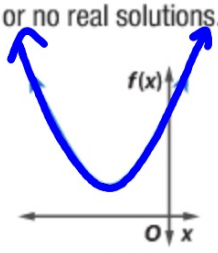
Models



one real solution



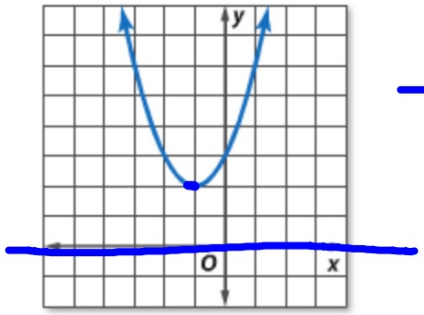
two real solutions



no real solution

Use the related graph of each equation to determine its solutions. (x-intercepts)

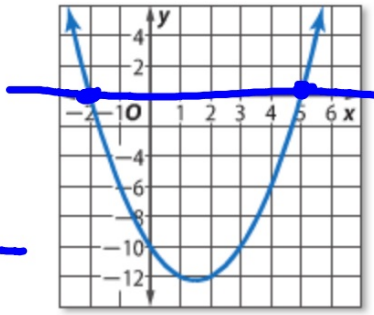
1. $x^2 + 2x + 3 = 0$



$y = x^2+2x+3$

$f(x) =$ no real so!

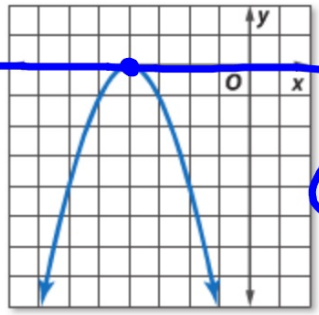
2. $x^2 - 3x - 10 = 0$



$x = -2$

$x = 5$

3. $-x^2 - 8x - 16 = 0$



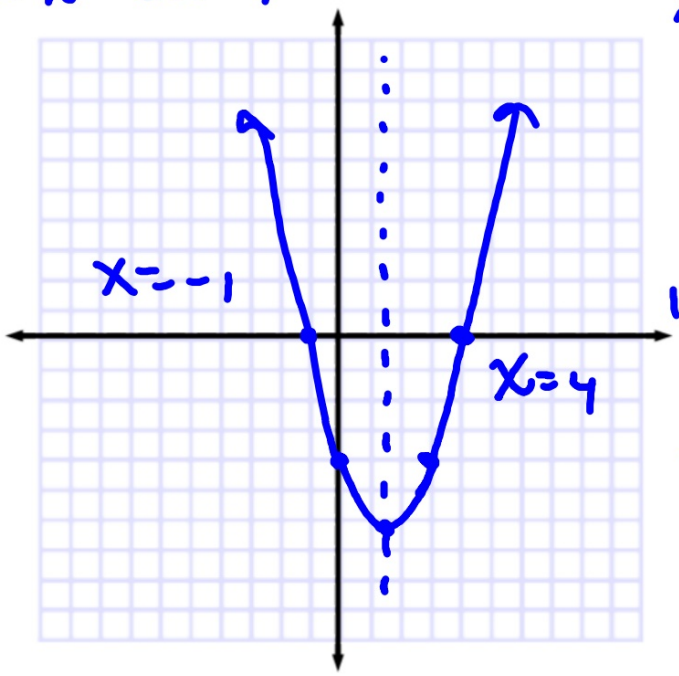
$x = -4$ (double root)

Example 1 Two Real Solutions

Solve $x^2 - 3x - 4 = 0$ by graphing.

Find x-intercepts of the graph:
How do you KNOW?

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



$x = \frac{-b}{2 \cdot a} = \frac{3}{2}$

$x = 1.5$

1.5	$1.5^2 - 3 \cdot 1.5 - 4$	-6.25
4	$16 - 12 - 4$	0
-1	$1 - 3 \cdot -1 - 4$	0
	$1 + 3 - 4$	

Whiteboards:

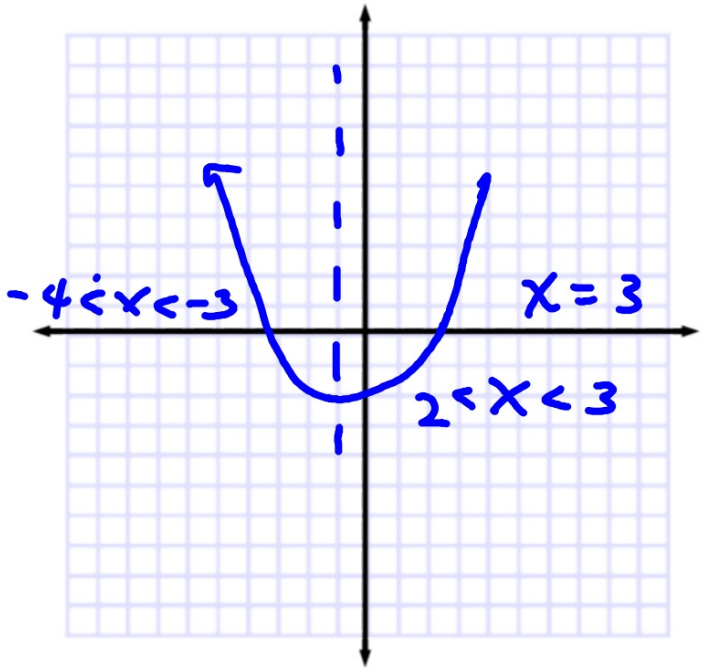
GuidedPractice

Solve each equation by graphing.

1A. $x^2 + 2x - 15 = 0$

$x = -\frac{2}{2} = -1$

-1	$-1\cdot-1 + 2\cdot-1 - 15$ $\quad -16$
2	$4 + 2\cdot2 - 15$ $\quad -7$
4	$16 + 8 - 15$ $\quad 9$
3	$9 + 6 - 15$ $\quad 0$
-5	$25 + -10 - 15$ $\quad 0$

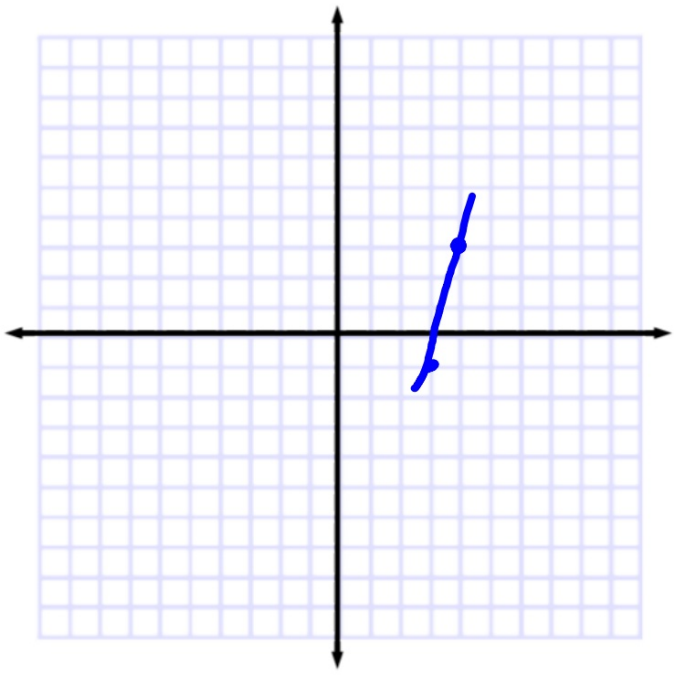


Start with standard form...

1B. $x^2 - 8x = -12$

$+12 \quad +12$

$x^2 - 8x + 4 = 0$



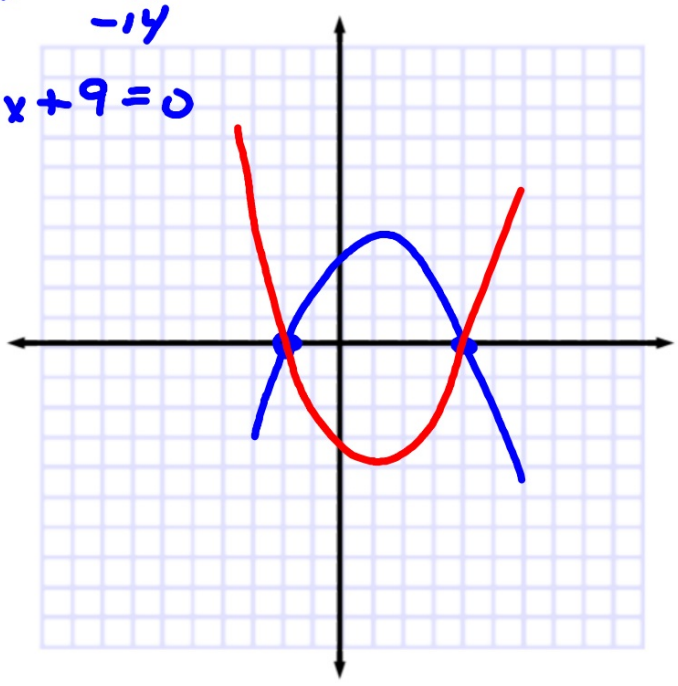
Example 2 One Real Solution

Solve $14 - x^2 = -6x + 23$ by graphing.

$+x^2 \quad +x^2$

$-14 \quad -14$

$x^2 - 6x + 9 = 0$

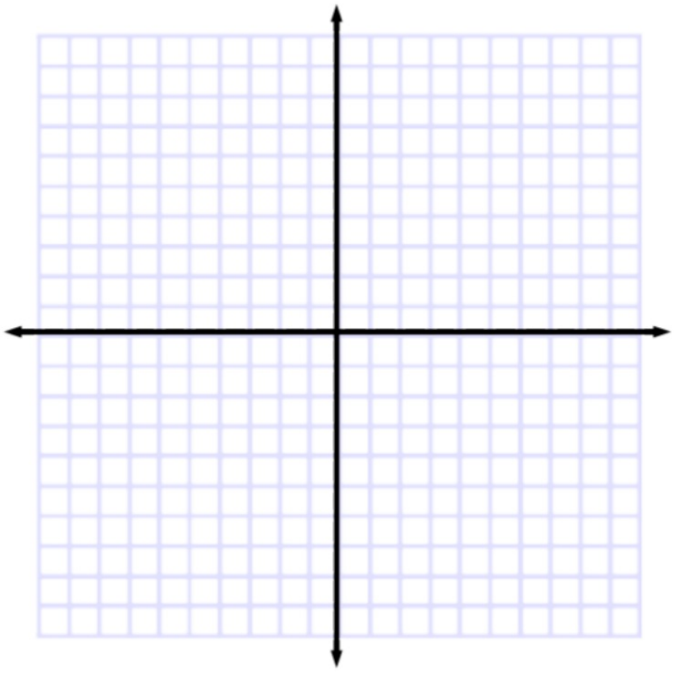


Whiteboards:

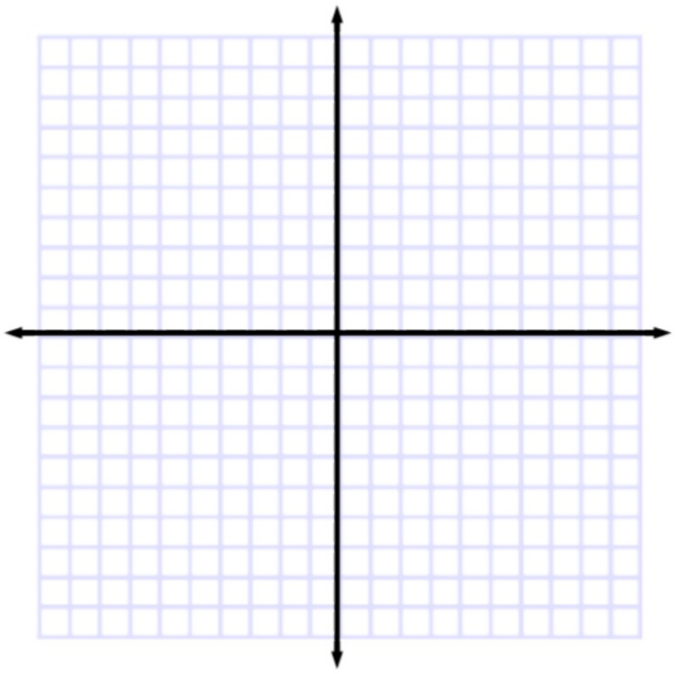
GuidedPractice

Solve each equation by graphing.

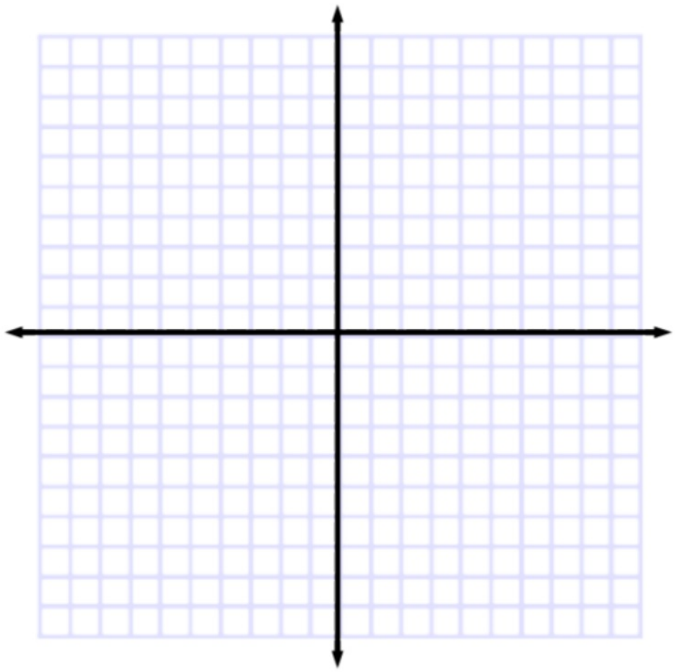
2A. $x^2 + 5 = -8x - 11$



2B. $12 - x^2 = 48 - 12x$



8. $x^2 - 6x + 4 = -8$



9. $9 - x^2 = 12$