
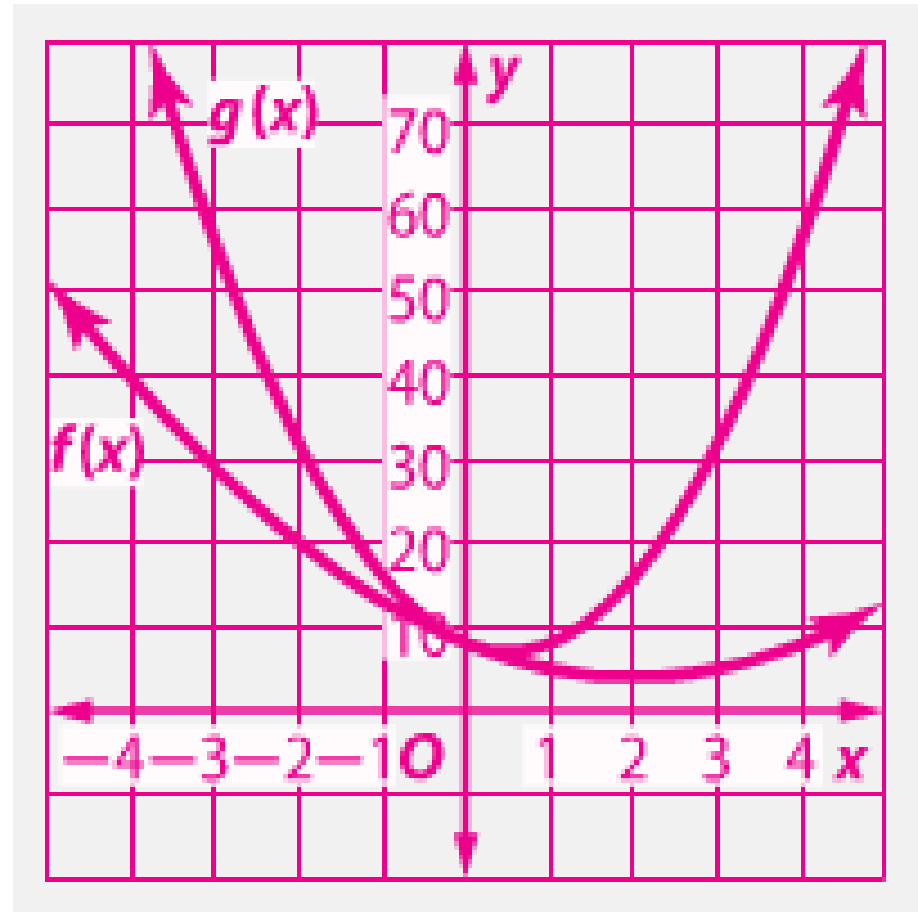


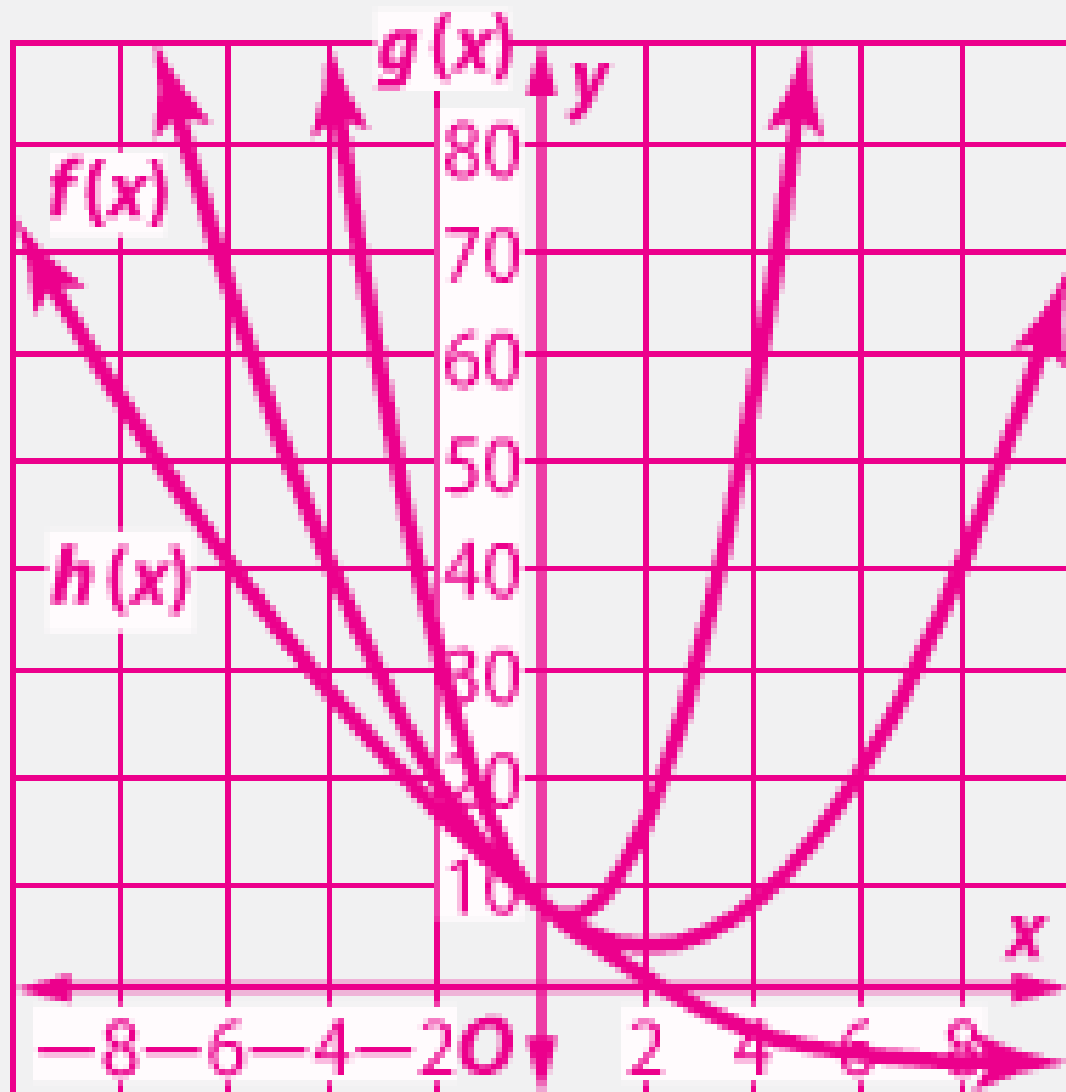
Investigation

-  **MULTIPLE REPRESENTATIONS** Consider $f(x) = x^2 - 4x + 8$ and $g(x) = 4x^2 - 4x + 8$.
- Tabular** Make a table of values for $f(x)$ and $g(x)$ if $-4 \leq x \leq 4$.
 - Graphical** Graph $f(x)$ and $g(x)$.
 - Verbal** Explain the difference in the shapes of the graphs of $f(x)$ and $g(x)$. What value was changed to cause this difference?
 - Analytical** Predict the appearance of the graph of $h(x) = 0.25x^2 - 4x + 8$. Confirm your prediction by graphing all three functions if $-10 \leq x \leq 10$.

Answer

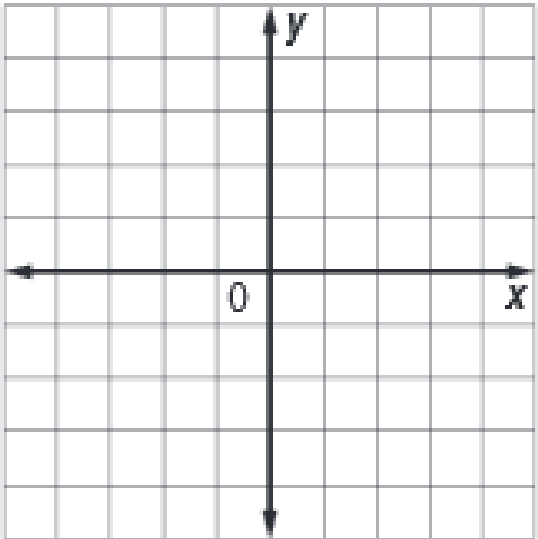
x	$f(x)$	$g(x)$
-4	40	88
-3	29	56
-2	20	32
-1	13	16
0	8	8
1	5	8
2	4	16
3	5	32
4	8	56





Investigation

Graph the linear function and solve the related linear equation.

$y = 2x - 5$ 	$2x - 5 = 0$	<p>How is the graph related to the solution of the equation?</p>
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LT 3.4

Solving Quadratic Functions
by Graphing

LT 3.1-3.2

1. **Graph** quadratic functions.

$$f(x) = ax^2 + bx + c$$

BY

Using a table

Using the equation of the
axis of symmetry

LT 3.4

1. **Solve** quadratic equations.

$$f(x) = ax^2 + bx + c$$

BY

Graphing

Learning Objective

I will be able to . . .

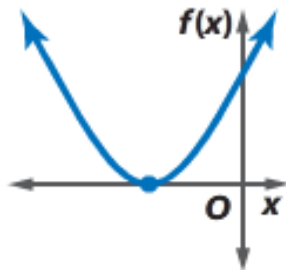
* Solve quadratic equations by graphing.

Solutions

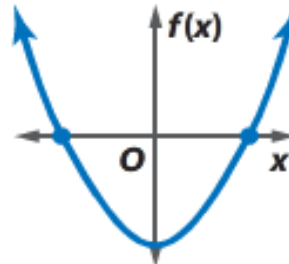
KeyConcept Solutions of a Quadratic Equation

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

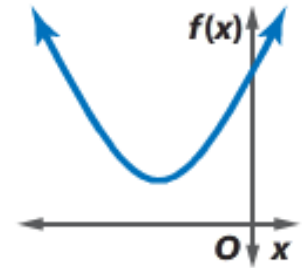
Models



one real solution



two real solutions



no real solution

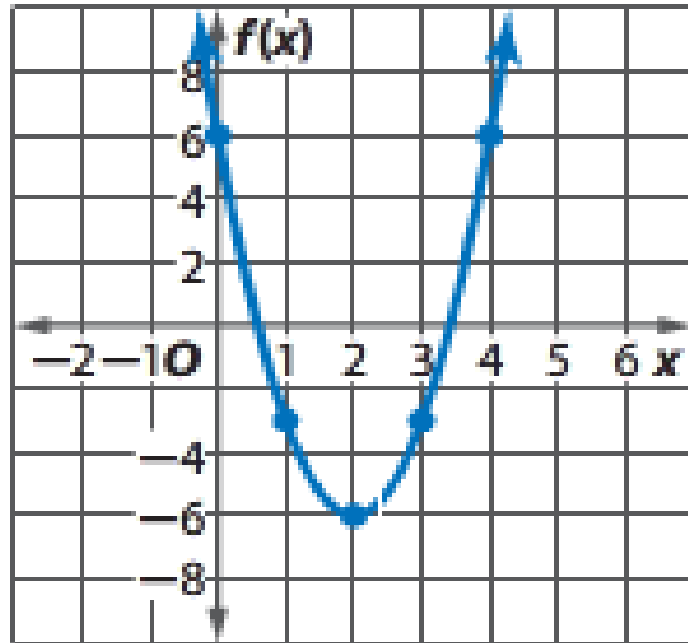
Quadratic Function

$$f(x) = ax^2 + bx + c, \text{ where } a \neq 0$$

quadratic term

linear term

constant term



Solve Quadratic Function

When we solve, we find the value of x .

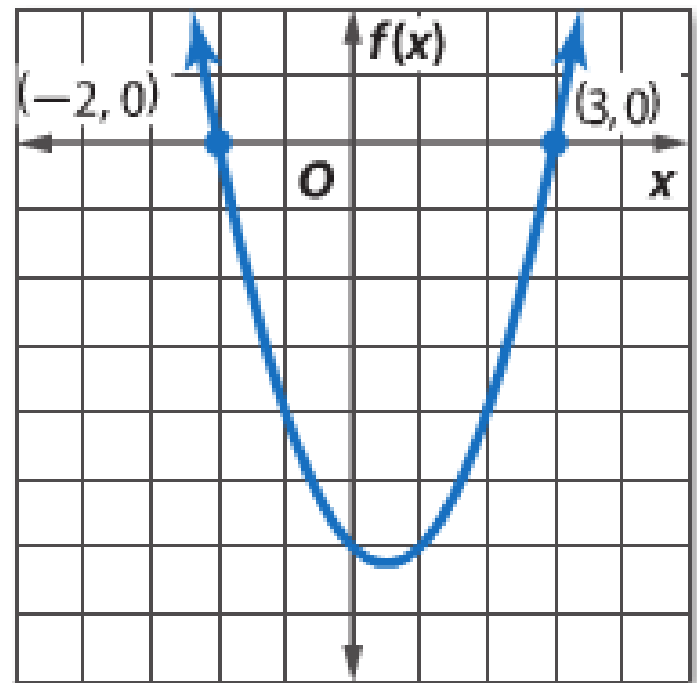
The solutions of a quadratic equation are called the **roots** of the equation.

One method of finding the roots of a quadratic equation is to find the zeros of the related quadratic function.

Zeros of a function

The **zeros** of a function (Roots of the equation) are the x -intercepts of its graph.

Graph of Function



The x -intercepts are -2 and 3 .

Review

We learned two ways to graph a function.

- 1) Using a table
- 2) Using the equation of the axis of symmetry.

Ex. 1 Solve $x^2 - 3x - 4 = 0$ by graphing.

Graph the related function, $f(x) = x^2 - 3x - 4$.

Method 2: Find the vertex $(x,y) =$

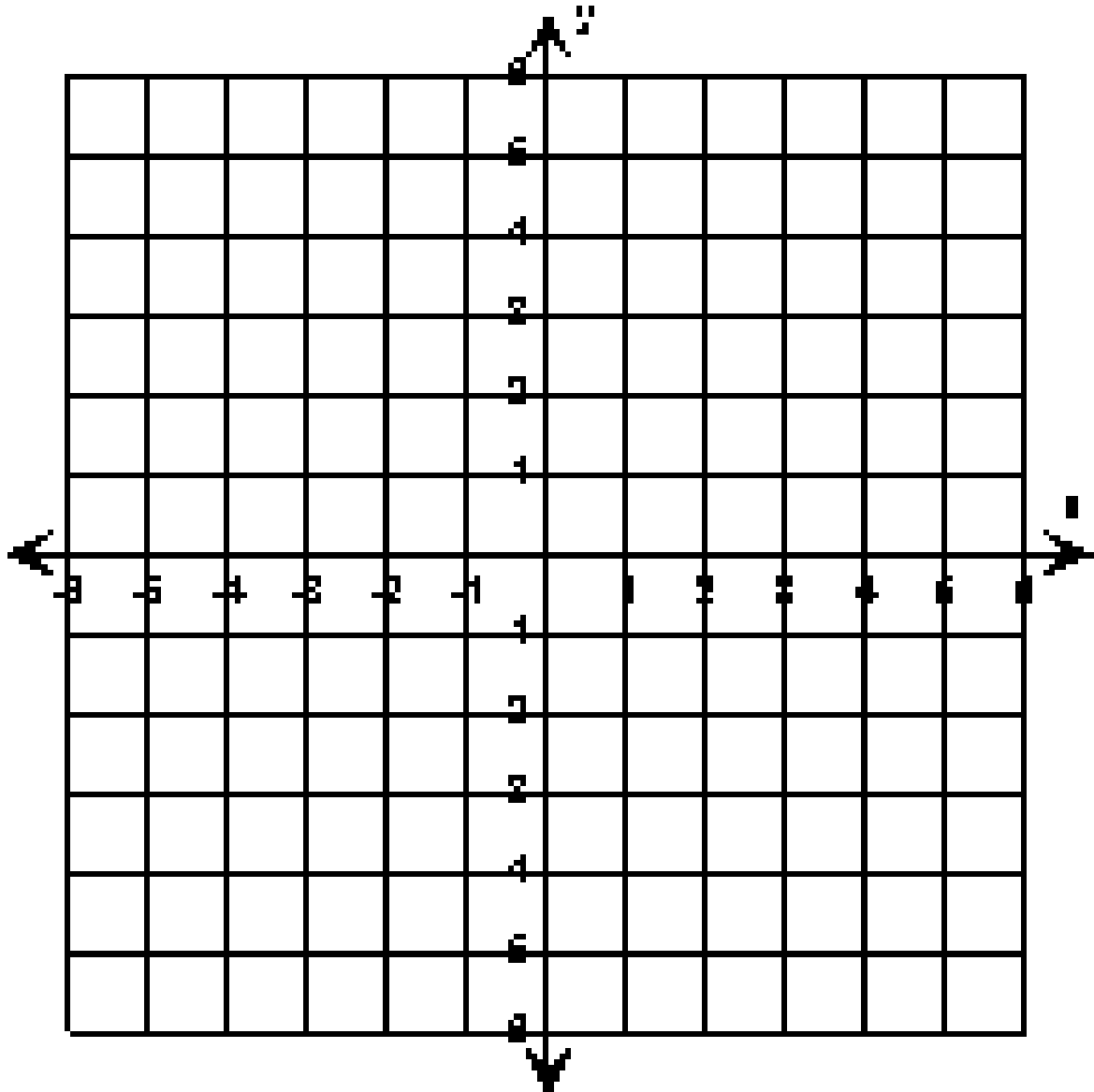
$$x = -\frac{-3}{2(1)} \text{ or } 1.5. \quad (1.5, -6.25)$$

Method 3: Maximum and minimum: How many solutions does the Graph have?

Method 1: Make a table

x	-1	0	1	1.5	2	3	4
$f(x)$	0	-4	-6	-6.25	-6	-4	0

Example 1



The solutions
are:

Example 2

Solve each equation by graphing.

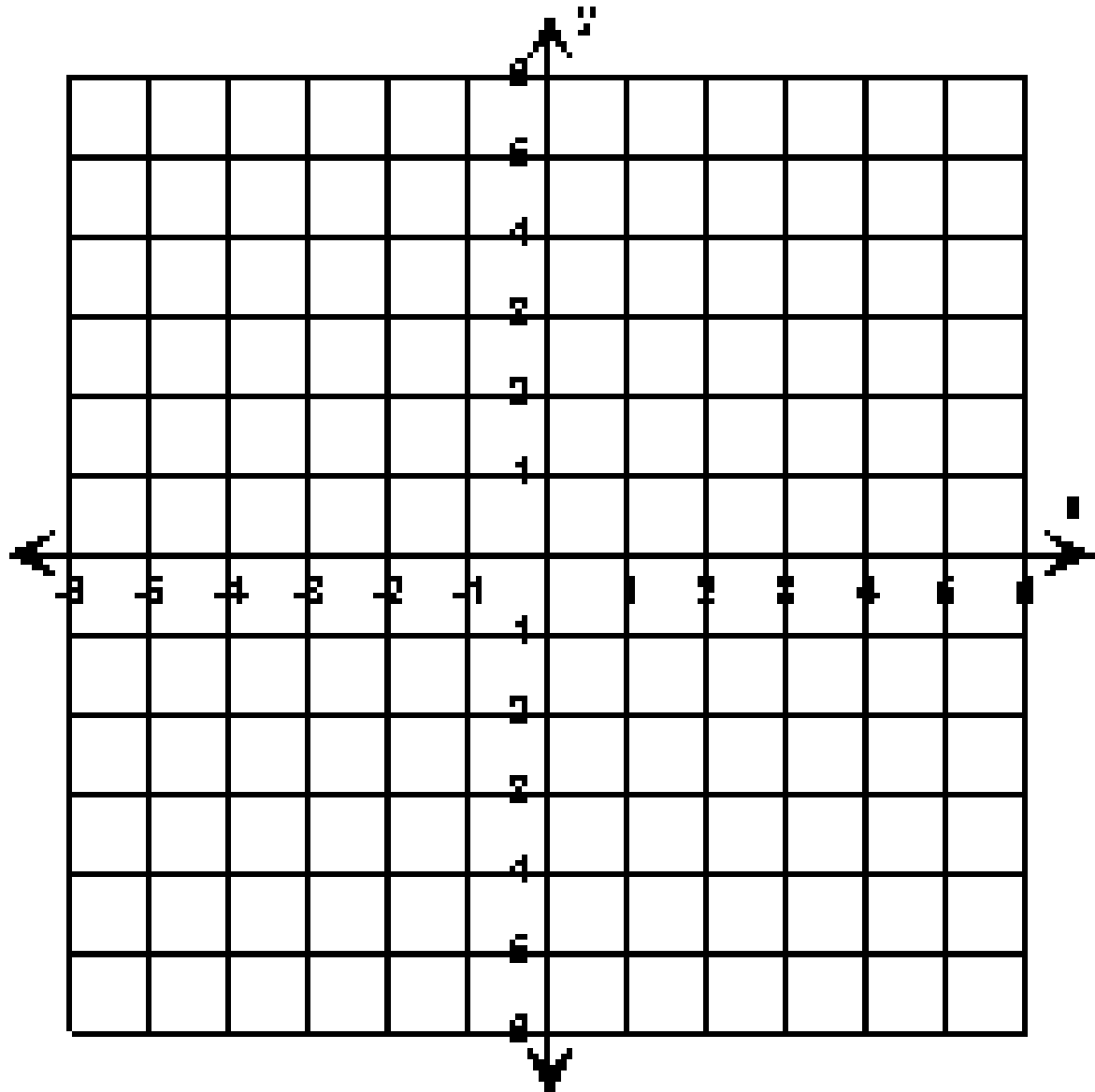
$$x^2 - 8x = -12$$

- 1) Solve the related function:
- 2) Find the vertex (x,y)
- 3) Maximum or minimum

Graph Using a Table

x		f(x)	(x, f(x))

Example 2



The solutions
are:

Example 3

Solve each equation by graphing.

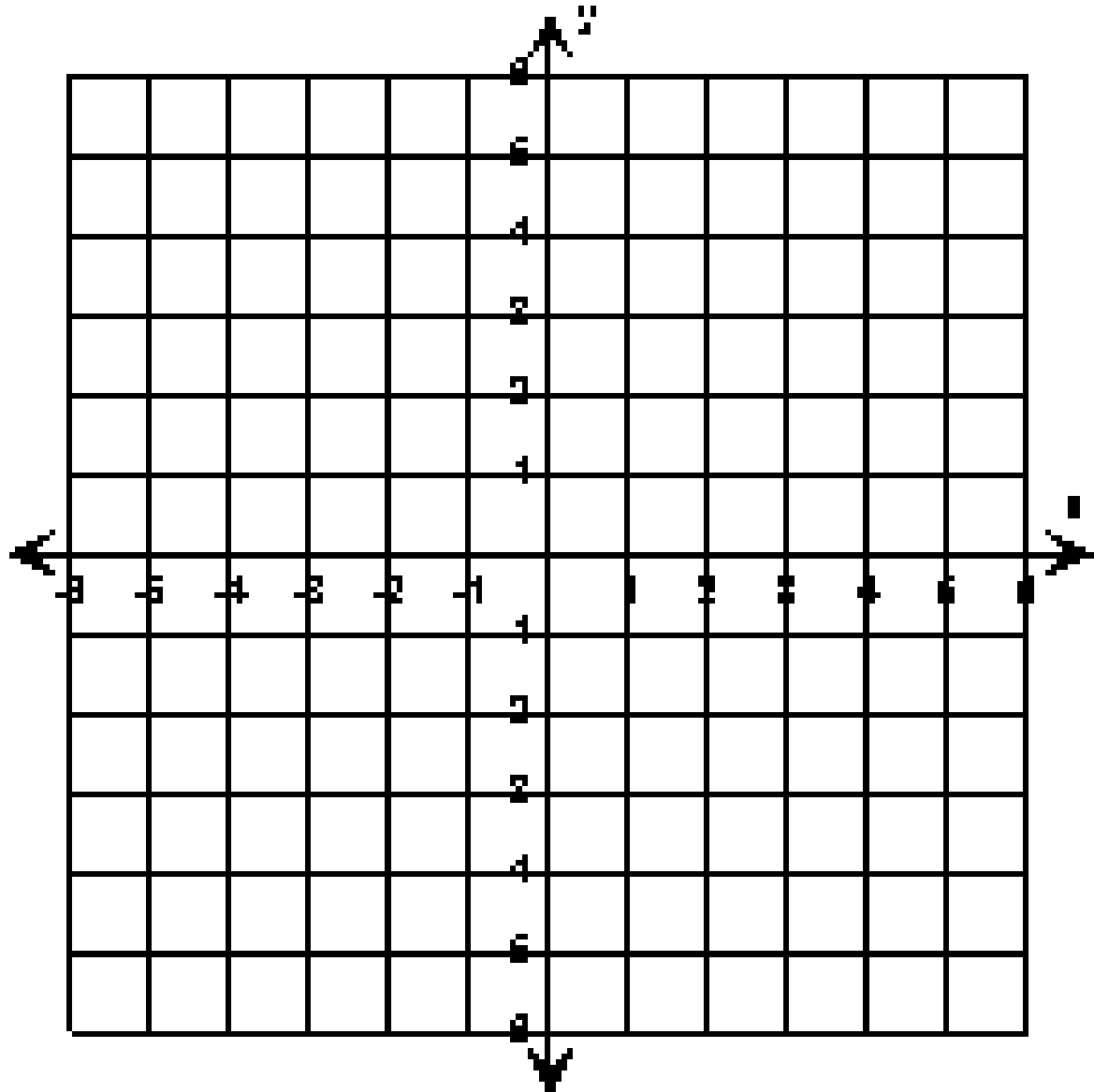
$$x^2 + 2x - 15 = 0$$

- 1) Solve the related function:
- 2) Find the vertex (x,y)
- 3) Maximum or minimum

Graph Using a Table

x		f(x)	(x, f(x))

Example 3



The solutions
are:

Example 4

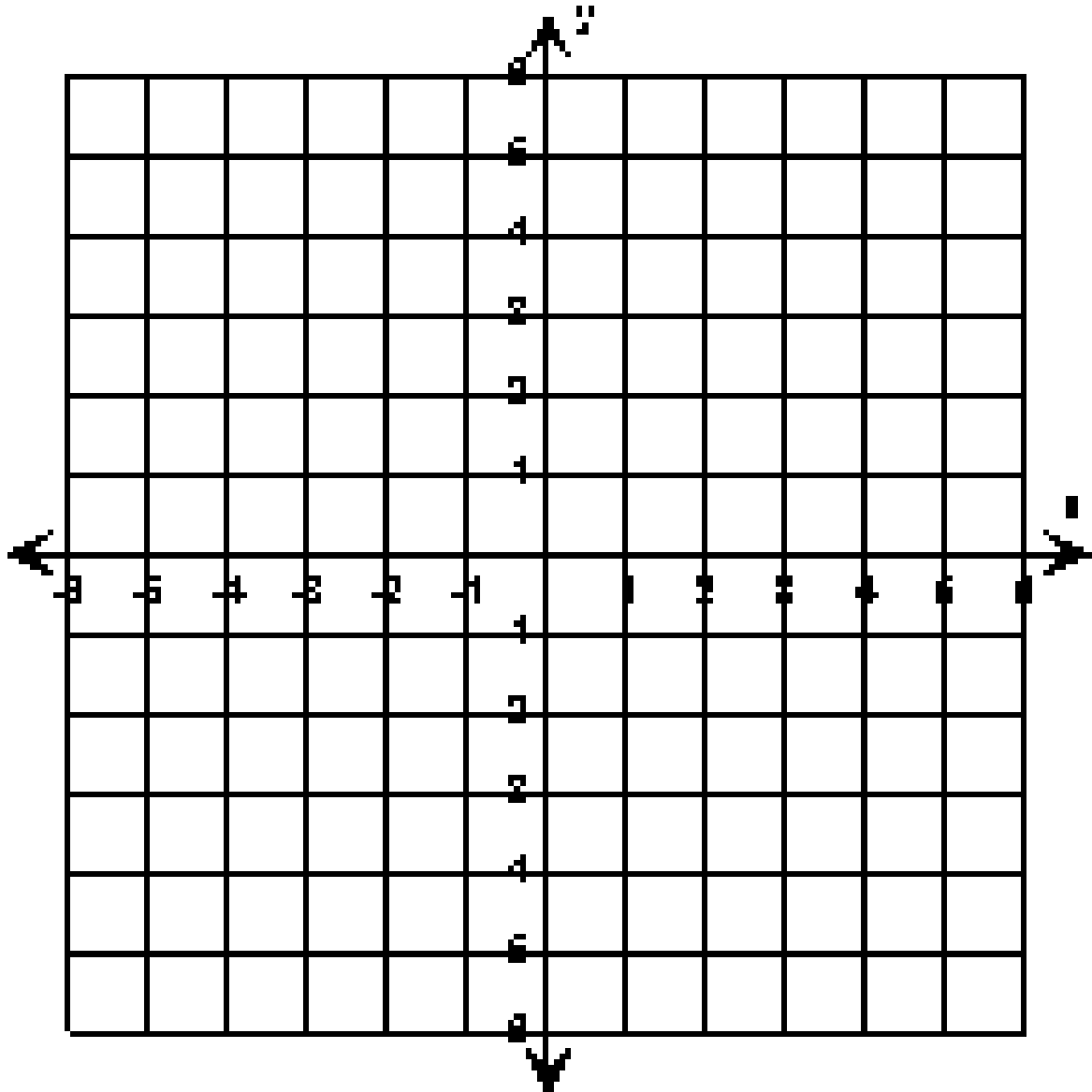
Solve $x^2 - 4x = -4$ by graphing

- 1) Solve the related function:
- 2) Find the vertex (x,y)
- 3) Maximum or minimum

Graph Using a Table

x		f(x)	(x, f(x))

Example 4



The solutions
are:

Example 5

Solve by graphing: $-x^2 + 15x - 63 = 0$

1) Solve the related function:

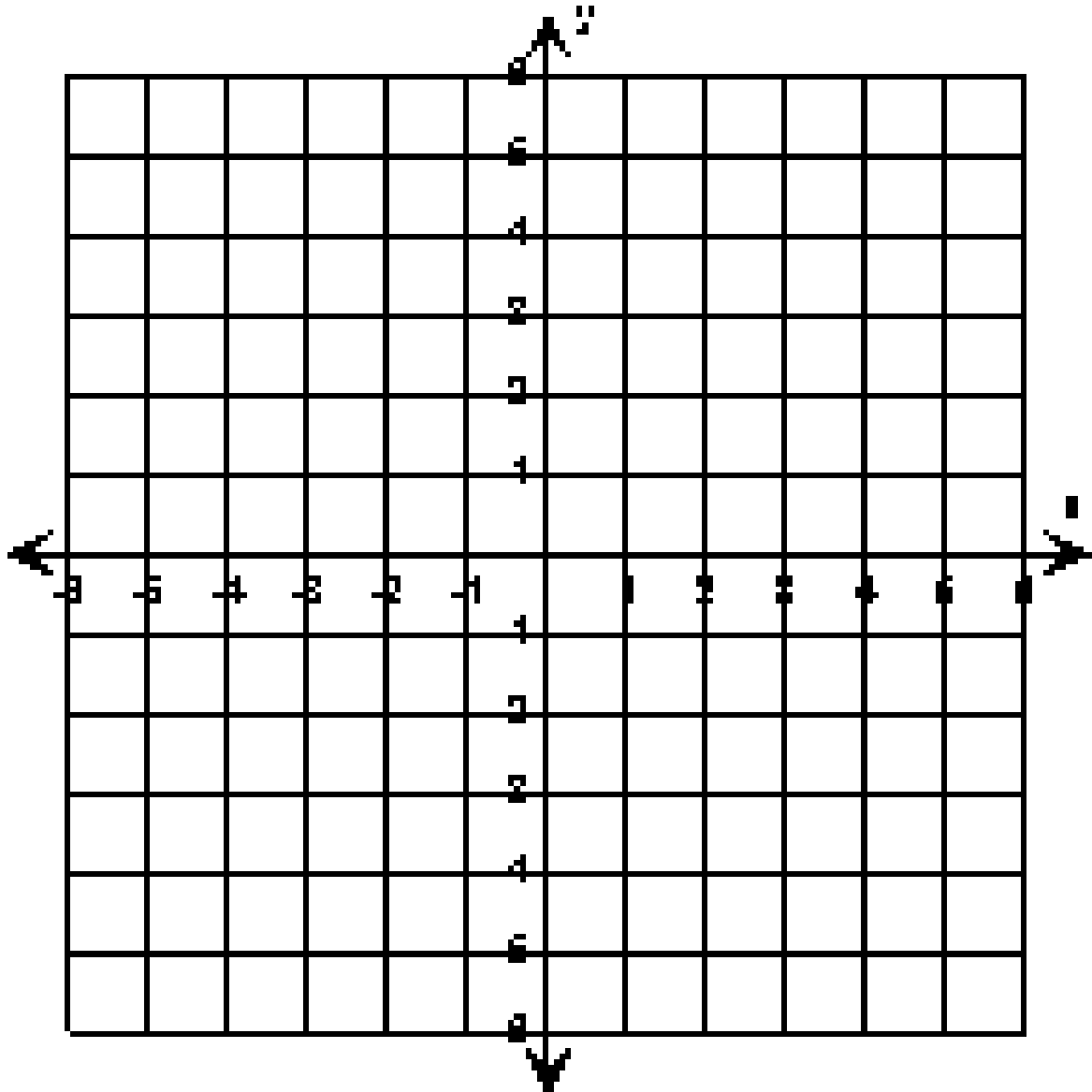
2) Find the vertex (x,y)

3) Maximum or minimum

Graph Using a Table

x		f(x)	(x, f(x))

Example 5



The solutions
are:

Learning Objective

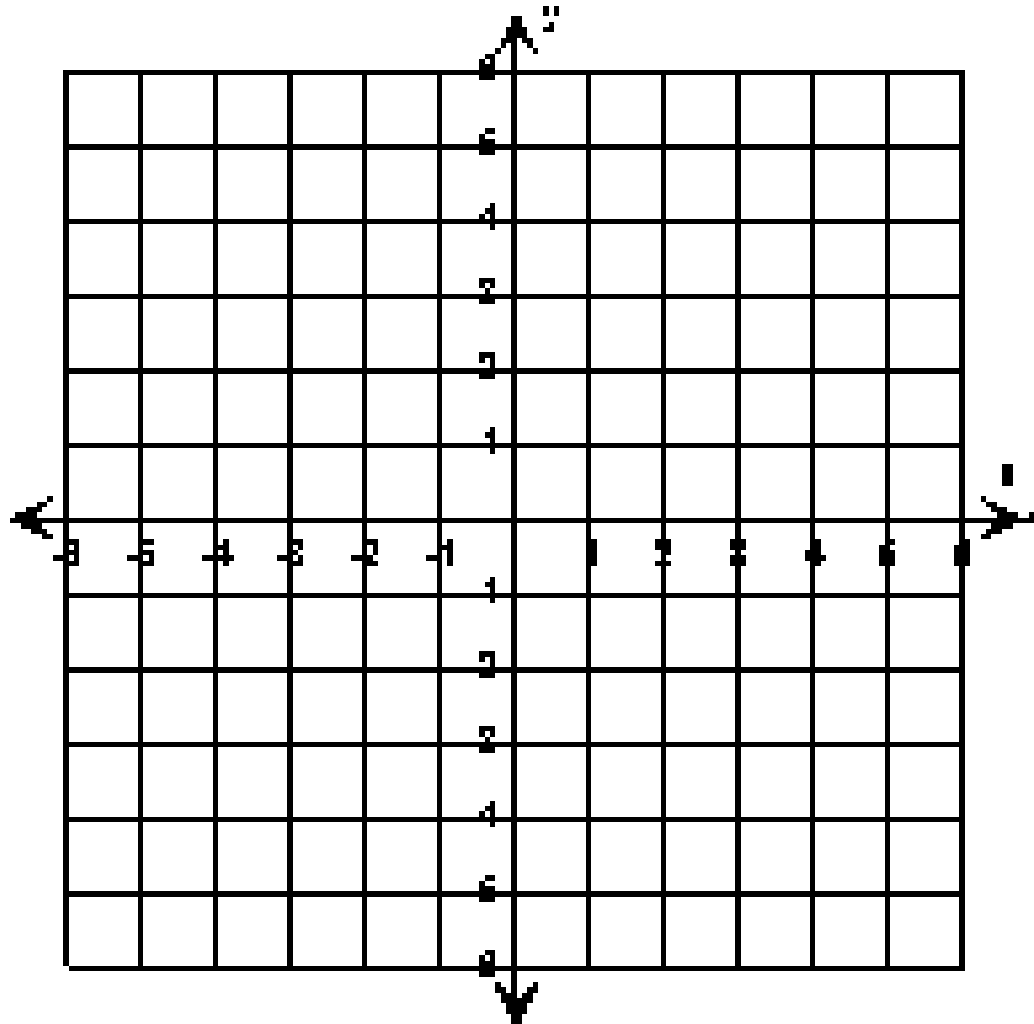
I will be able to . . .

- * Solve quadratic equations by graphing.
- * Estimate solutions of quadratic equations by graphing.

Example 1

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

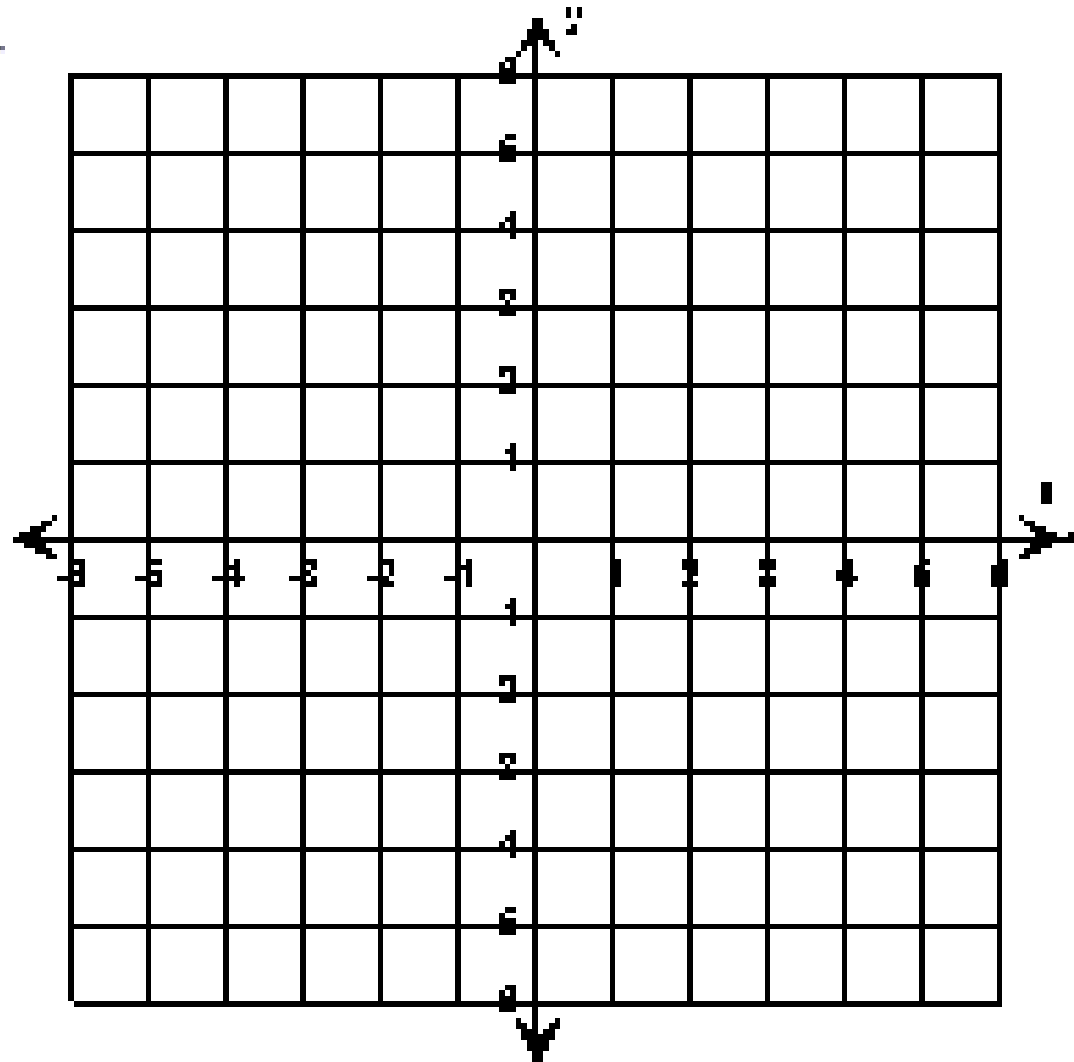
1) Solve the related function: $f(x) = x^2 - 6x + 9$.



Example 2

Solve the equation by graphing.

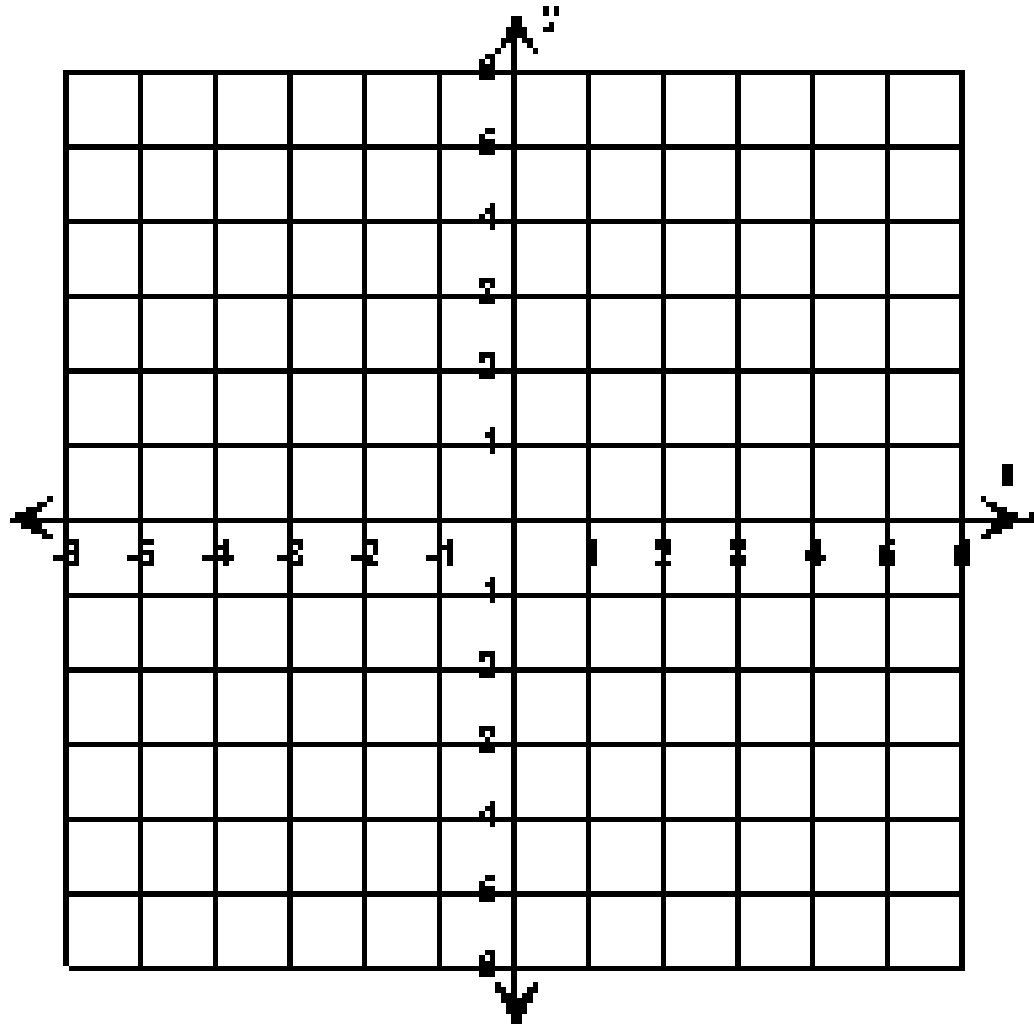
1. $x^2 + 5 = -8x - 11$



Example 3

Solve $x^2 - 6x + 4 = 0$ by graphing.

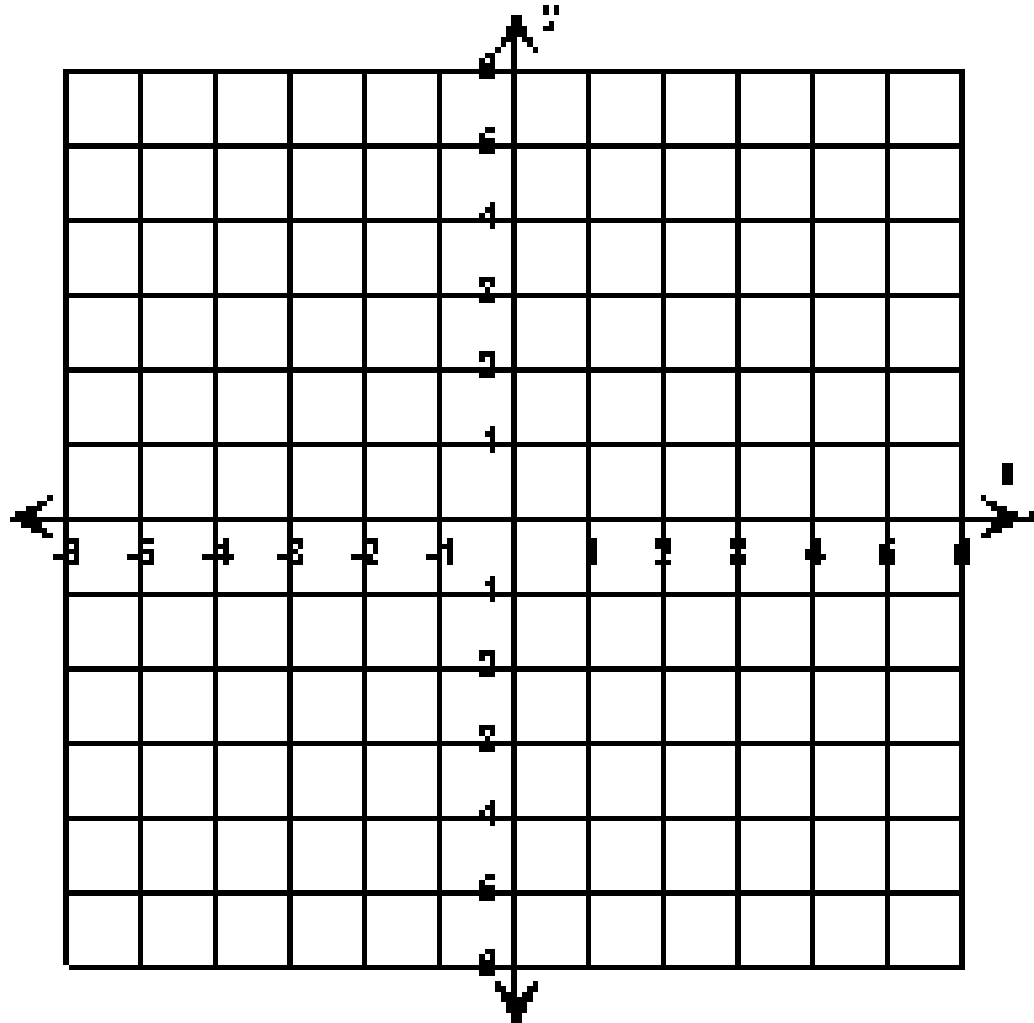
1) Solve the related function: $f(x) =$



Example 4

Solve $x^2 - x - 10 = 0$ by graphing.

1) Solve the related function: $f(x) =$



Steps

Steps to solve by graphing

1) $a =$

2) Vertex

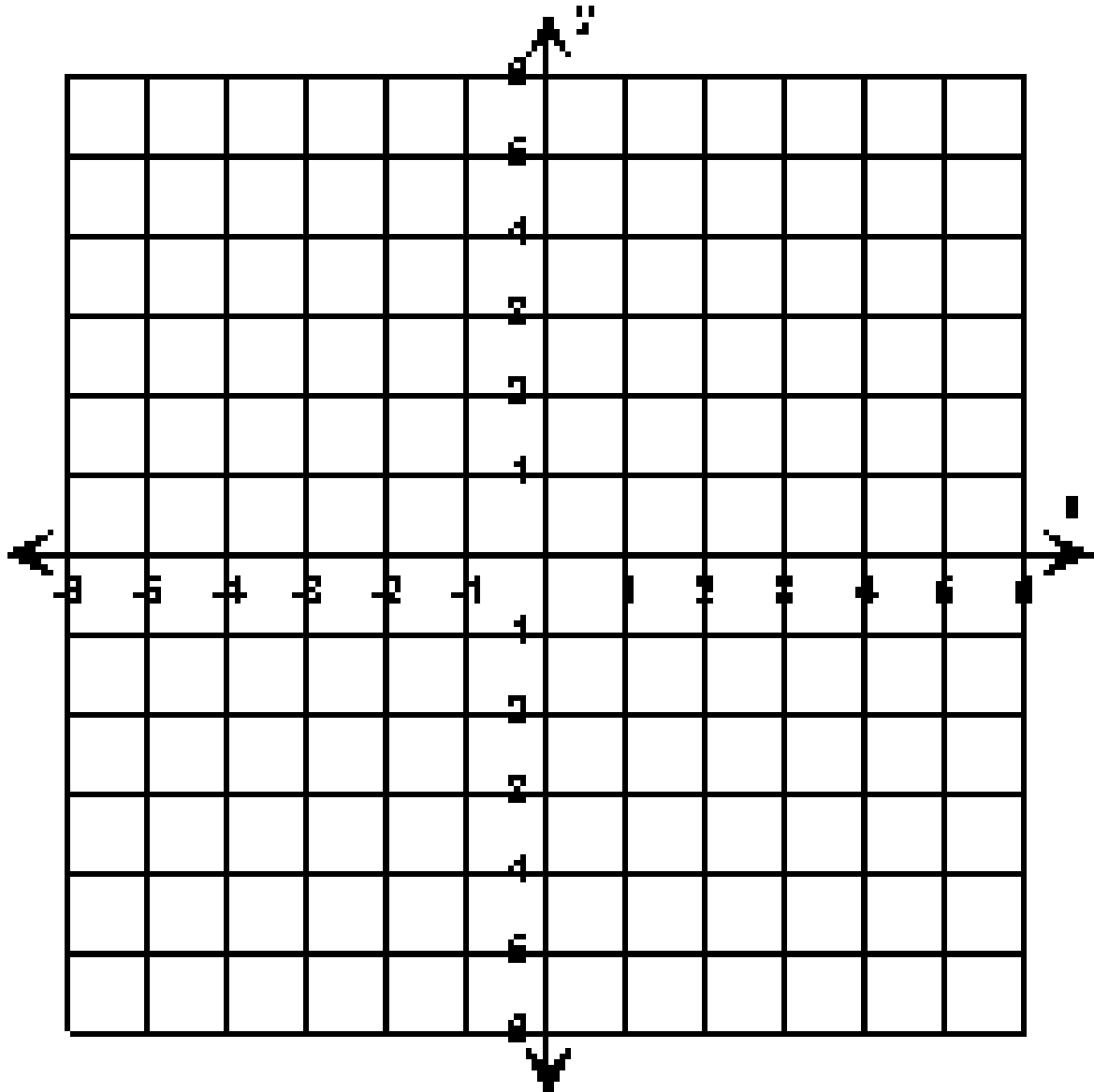
$x =$

3) How many solutions will the quadratic function have?

4) Make a table

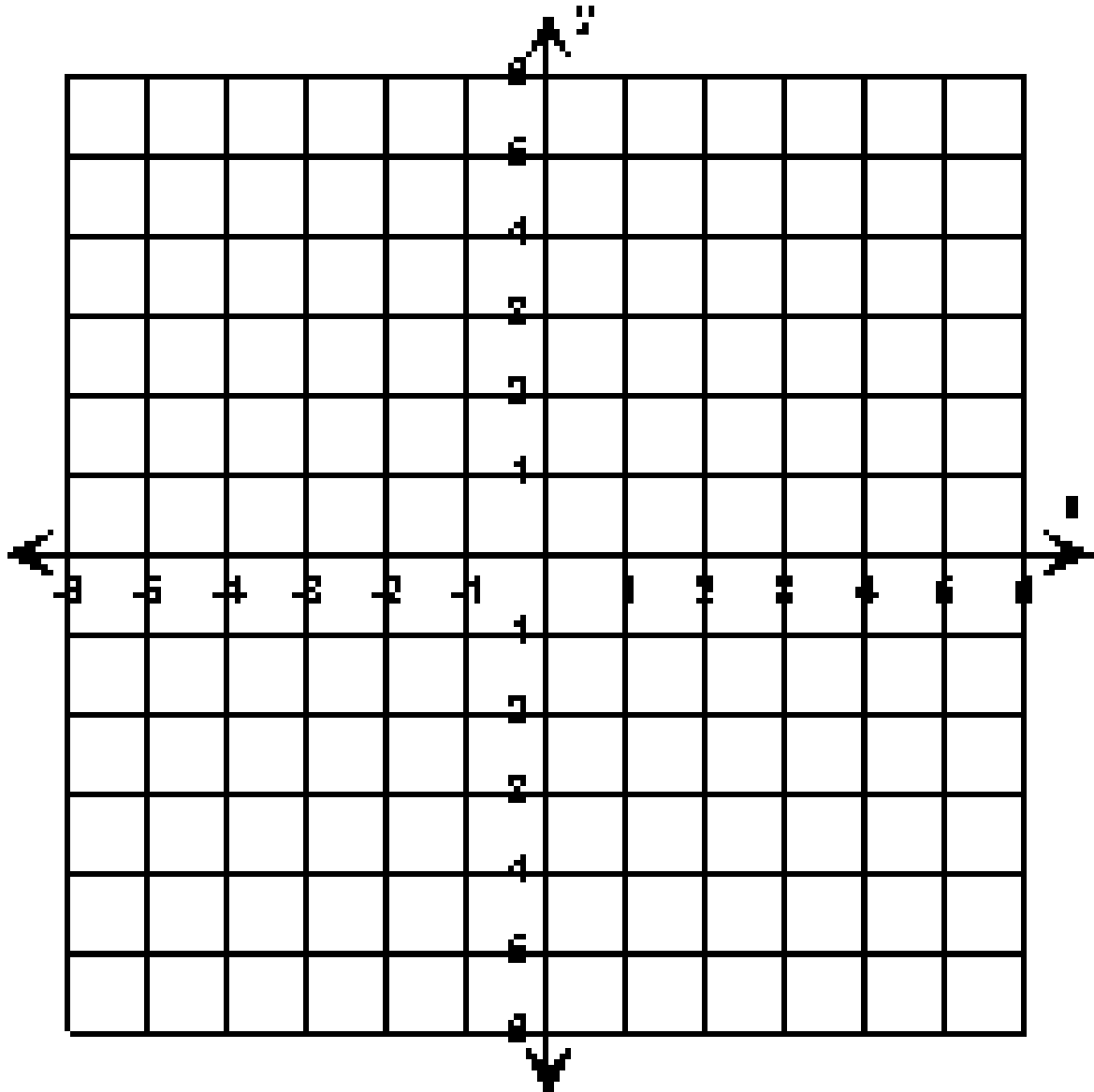
5) Graph

Example



The solutions
are:

Example



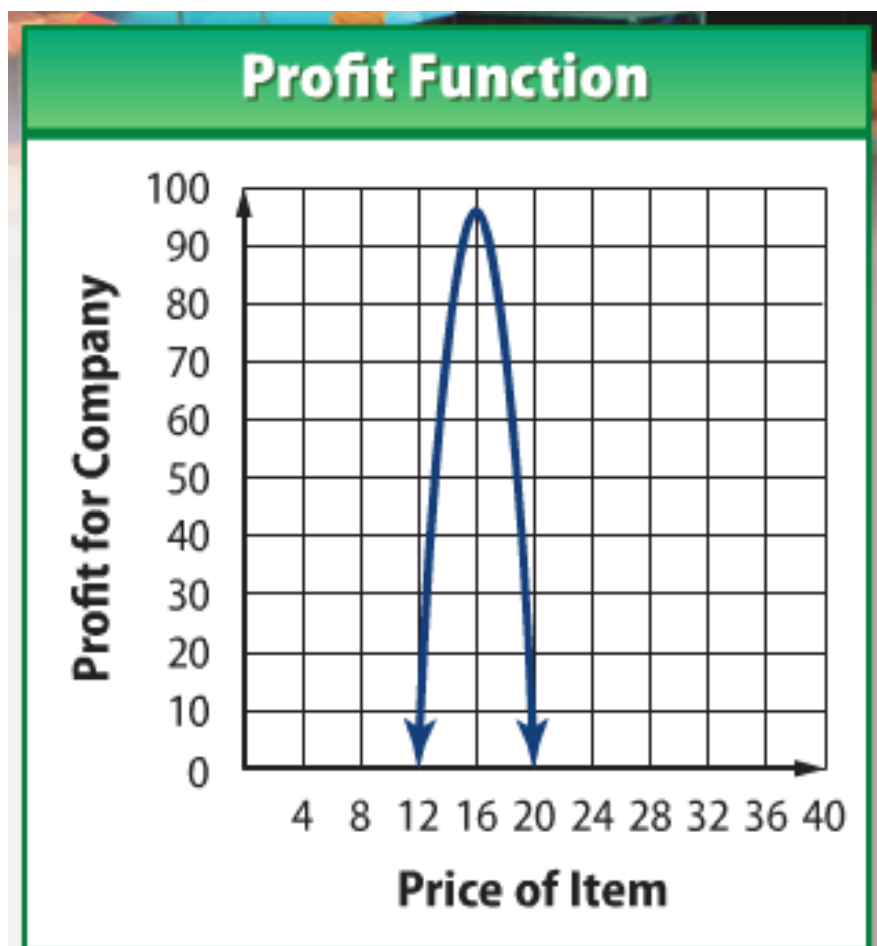
The solutions
are:

Investigation

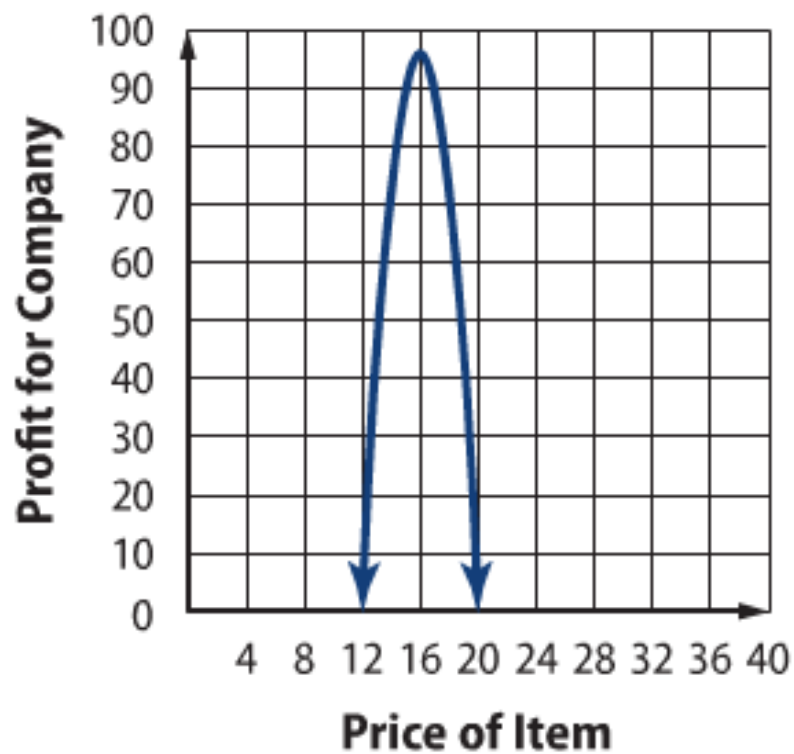
Arielle works in the marketing department of a major retailer. Her job is to set prices for new products sold in the stores. Arielle determined that for a certain product, the function $f(p) = -6p^2 + 192p - 1440$ tells the profit $f(p)$ made at price p .

Arielle can determine the price range by finding the prices for which the profit is equal to \$0. This can be done by finding the solutions of the related quadratic equation $0 = -6p^2 + 192p - 1440$.

Help Arielle determine the price range by using the graph below!



Profit Function



The graph of the function indicates that the profit is zero at 12 and 20, so the profitable price range of the item is between \$12 and \$20.