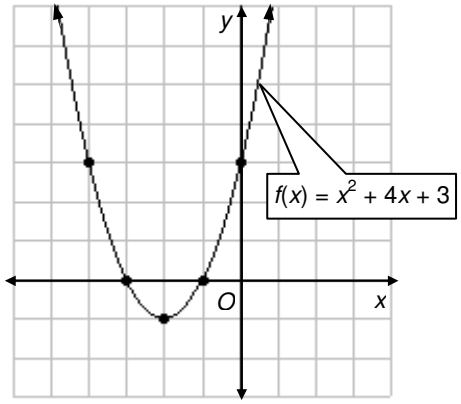
Solving Quadratic Equations by Graphing

The *standard form* of a quadratic equation is $ax^2 + bx + c = 0$, where $a \neq 0$, and a, b, and c, are integers. The solutions of a quadratic equation are called the *roots* of the equation and are located at the x-intercepts of the graph of the related quadratic function.

Example 1 **Two Roots**

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

Graph the related function $f(x) = x^2 + 4x + 3$. The equation of the axis of symmetry is $x = -\frac{4}{2(1)}$ or -2. The vertex is at $(-2, -1)$. Graph the vertex and several other points on either side of the axis of symmetry.

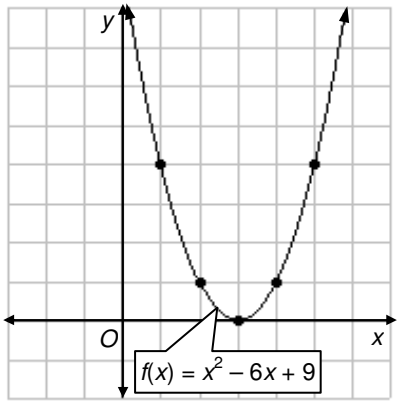


To solve $x^2 + 4x + 3 = 0$, you need to know where the value of $f(x) = 0$. This occurs at the x-intercepts, -3 and -1. Therefore, the solutions of $x^2 + 4x + 3 = 0$ are -3 and -1.

Example 1 **One Root**

Solve $x^2 - 6x + 9 = 0$ by graphing.

Graph the related function $f(x) = x^2 - 6x + 9$. The equation of the axis of symmetry is $x = -\frac{6}{2(1)}$ or 3. The vertex is at $(3, 0)$. Graph the vertex and several other points on either side of the axis of symmetry.

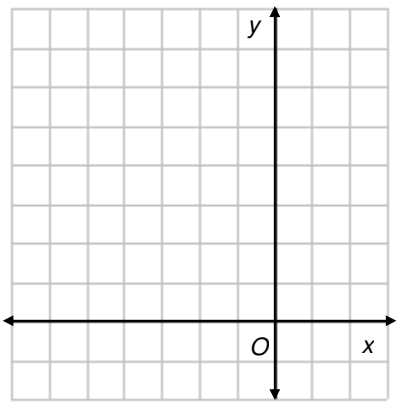


To solve $x^2 - 6x + 9 = 0$, you need to know where the value of $f(x) = 0$. The vertex of the parabola is the x-intercept. Thus, the only solution of $x^2 - 6x + 9 = 0$ is 3.

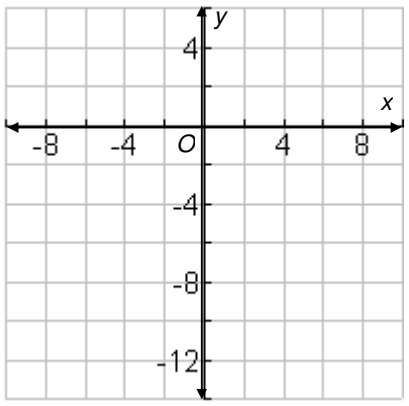
Exercises

Solve each equation by graphing.

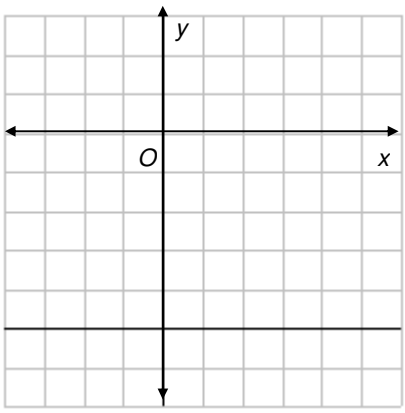
1. $x^2 + 7x + 12 = 0$



2. $x^2 - x - 12 = 0$



3. $x^2 - 4x + 5 = 0$



Solving Quadratic Equations

Answers

1. –3, –4

2. -3, 4

3. no real roots