

Solving Quadratic Equations by Graphing

(Pages 468–473)

The solutions of a **quadratic equation** are called the **roots** of the equation. You can find the roots by finding the x -intercepts or **zeros** of the related quadratic function.

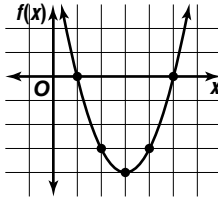
EXAMPLES

- A** Find the roots of $x^2 - 6x + 5 = 0$ by graphing the related function.

First, find the equation of the axis of symmetry. Next, make a table of values using x -values around the axis of symmetry. Then graph the related function $f(x) = x^2 - 6x + 5$.

$$x = -\frac{b}{2a} \quad x = -\frac{-6}{2(1)} \text{ or } 3$$

x	$x^2 - 6x + 5$	$f(x)$
1	$1^2 - 6(1) + 5$	0
2	$2^2 - 6(2) + 5$	-3
3	$3^2 - 6(3) + 5$	-4
4	$4^2 - 6(4) + 5$	-3
5	$5^2 - 6(5) + 5$	0



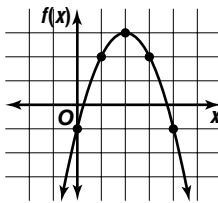
The zeros of the function appear to be 1 and 5. So, the roots are 1 and 5.

- B** Estimate the roots of $-x^2 + 4x - 1 = 0$.

Find the axis of symmetry and use it to make a table of values. Then graph the related function.

$$x = -\frac{b}{2a} \quad x = -\frac{4}{2(-1)} \text{ or } 2$$

x	$-x^2 + 4x - 1$	$f(x)$
0	$-0^2 + 4(0) - 1$	-1
1	$-(1)^2 + 4(1) - 1$	2
2	$-(2)^2 + 4(2) - 1$	3
3	$-(3)^2 + 4(3) - 1$	2
4	$-(4)^2 + 4(4) - 1$	-1



Since the x -intercepts are between 0 and 1 and between 3 and 4, one root is between 0 and 1 and the other root is between 3 and 4.

PRACTICE

Solve each equation by graphing the related function. If exact roots cannot be found, state the consecutive integers between which the roots are located.

- $x^2 + 2x - 3 = 0$
- $x^2 - 7x + 10 = 0$
- $-x^2 + 6x - 7 = 0$
- $x^2 + 8x + 12 = 0$
- $x^2 + 3x - 4 = 0$
- $x^2 - 2x - 3 = 0$
- $-x^2 - 2x + 4 = 0$
- $-x^2 + 5x + 2 = 0$
- $2x^2 + 2x - 4 = 0$



- 10. Standardized Test Practice** The roots of a quadratic equation correspond to the ? of the graph of the related function.

- A** x -intercepts **B** y -intercepts **C** vertex **D** maximum

Answers: 1. -3, 1 2. -2, 5 3. between 1 and 2; between 4 and 5 4. -6, -2 5. -4, 1 6. -1, 3 7. between -4 and -3; between 1 and 2 8. between -1 and 0; between 5 and 6 9. -2, 1 10. A