

Zeros of Quadratic Functions

A **zero of a function** f is an x -value for which $f(x) = 0$. If a real number k is a zero of the function $f(x) = ax^2 + bx + c$, then k is an x -intercept of the graph of the function.

Example 1 Find the zeros of each function.

a. $f(x) = 9x^2 - 1$

Set $f(x)$ equal to 0. Then use square roots to solve for x .

$$9x^2 - 36 = 0$$

$$9x^2 = 36$$

$$x^2 = 4$$

$$x = \pm\sqrt{4}$$

$$x = \pm 2$$

► The zeros of the function are $x = -2$ and $x = 2$.

b. $f(x) = x^2 - 2x - 8$

Set $f(x)$ equal to 0. Then use factoring to solve for x .

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

$$(x - 4)(x + 2) = 0$$

$$x - 4 = 0 \quad \text{or} \quad x + 2 = 0$$

$$x = 4 \quad \text{or} \quad x = -2$$

► The zeros of the function are $x = -2$ and $x = 4$.

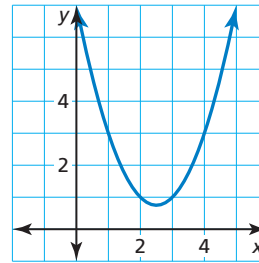
Example 2 Find the zeros of $f(x) = x^2 - 5x + 7$.

Set $f(x)$ equal to 0. Then use the Quadratic Formula to solve for x .

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(7)}}{2(1)} \\ &= \frac{5 \pm \sqrt{-3}}{2} \\ &= \frac{5 \pm i\sqrt{3}}{2} \end{aligned}$$

► The zeros of the function are $x = \frac{5}{2} + \frac{\sqrt{3}}{2}i$ and $x = \frac{5}{2} - \frac{\sqrt{3}}{2}i$.

Notice that the graph of f does not intersect the x -axis.



Practice

Check your answers at BigIdeasMath.com.

Find the zero(s) of the function.

1. $f(x) = 8x^2 + 32$ $x = \pm 2i$

3. $f(x) = x^2 - 8x + 16$ $x = 4$

5. $f(x) = 4(x + 5)(x - 1)$ $x = -5$ and $x = 1$

7. $f(x) = 3x^2 + 12x + 15$ $x = -2 \pm i$

9. $f(x) = -(x + 1)^2 + 18$ $x = -1 \pm 3\sqrt{2}$

2. $f(x) = -5x^2 + 40$ $x = \pm 2\sqrt{2}$

4. $f(x) = 4x^2 + 12x + 9$ $x = -\frac{3}{2}$

6. $f(x) = -\frac{1}{2}x(x + 3)$ $x = -3$ and $x = 0$

8. $f(x) = 2x^2 - x - 15$ $x = -\frac{5}{2}$ and $x = 3$

10. $f(x) = (x - 7)^2 + 9$ $x = 7 \pm 3i$