

Factors such as $(a + b)$ and $(a - b)$ are called **CONJUGATES**

Conjugate

The conjugate is where we **change the sign in the middle** of two terms like this:

$$\begin{array}{l} 3x + 1 \\ \text{Conjugate: } 3x - 1 \end{array}$$

Complex Conjugates: $a + bi$ and $a - bi$

$$(7 + 4i)(7 - 4i) =$$

The product of complex conjugates is always **a constant**

Find all Complex Solutions (real and imaginary).

1. $5 - 2x^2 = 101$

$$\begin{array}{r} -5 \quad -5 \\ -2x^2 = 96 \\ \hline -2 \quad -2 \\ \sqrt{x^2} = \sqrt{48} \end{array}$$

$$x = \pm 4i\sqrt{3}$$

2. $4x^2 + 83 = 26$

$$\begin{array}{r} -83 \quad -83 \\ \sqrt{\frac{4x^2}{4}} = \sqrt{\frac{-57}{4}} \end{array}$$

$$x = \pm \frac{\sqrt{-57}}{2}$$

Find all Complex Solutions (real and imaginary).

3. $(x + 7)^2 + 38 = 13$

$$\begin{array}{r} -38 \quad -38 \\ \sqrt{(x+7)^2} = \sqrt{-25} \end{array}$$

$$x + 7 = \pm 5i$$

$$x = \pm 5i - 7$$

3. $(x - 2)^2 + 16 = 1$

$$\begin{array}{r} -16 \quad -16 \\ \sqrt{(x-2)^2} = \sqrt{-15} \end{array}$$

$$x - 2 = \pm i\sqrt{15}$$

$$x = 2 \pm i\sqrt{15}$$

Complex solutions when using the Quadratic Formula

Solve.

$$x^2 - 6x + 25 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac = -64$$

$$\frac{6 \pm \sqrt{-64}}{2}$$

$$\frac{6 \pm 8i}{2} = 3 \pm 4i$$

Solve.

$$2x^2 - 10x + 17 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac = -36$$

$$\frac{10 \pm \sqrt{-36}}{4} = \frac{10 \pm 6i}{4} = \frac{5 \pm 3i}{2}$$

Solve.

$$3x^2 - 2x + 7 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac = -80$$

$$4 - 4 \times 3 \times 7 =$$

$$\frac{2 \pm \sqrt{-80}}{6} = \frac{2 \pm 4i\sqrt{5}}{6} = \frac{1 \pm 2i\sqrt{5}}{3}$$

$$\sqrt{80} = \sqrt{16 \cdot 5}$$

Solve.

$$-5x^2 + 3x - 8 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$b^2 - 4ac = -151$$

$$\frac{-3 \pm \sqrt{-151}}{-10} = \frac{-3 \pm i\sqrt{151}}{10}$$