

Algebra 2            4.6

Solve quadratic equations by using the quadratic formula  
Use the discriminant to determine the number and type  
of roots for a quadratic equation

standard form (of a quadratic)

discriminant

quadratic formula

$$ax^2 + bx + c = 0$$

complex number

conjugate pair

$$\sqrt{3} \pm i$$

irrational number

exact answer

QF song

whiteboards

## KeyConcept Quadratic Formula

**Words** The solutions of a quadratic equation of the form  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by the following formula.

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

**Example**  $x^2 + 5x + 6 = 0 \rightarrow x = \frac{-5 \pm \sqrt{5^2 - 4(1)(6)}}{2(1)}$

QF song!

### Guided Practice

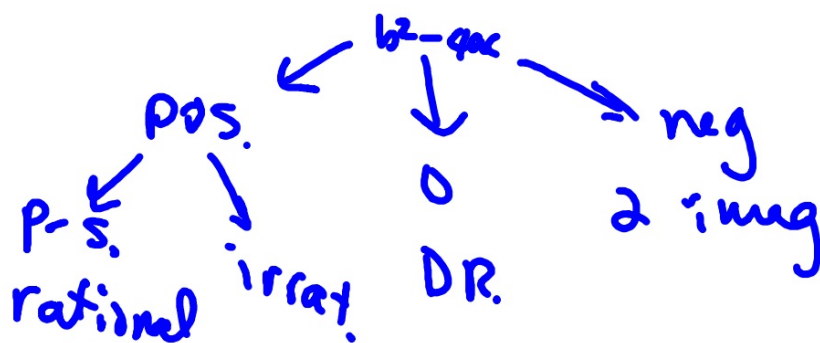
Solve each equation by using the Quadratic Formula.

**4A.**  $3x^2 + 5x + 4 = 0$

**4B.**  $x^2 - 4x = -13$

between the value of the expression under the radical and the roots of the quadratic equation. The expression  $b^2 - 4ac$  is called the **discriminant**.

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



Just the part in **RED!**

### Example 5 Describe Roots



Find the value of the discriminant for each quadratic equation. Then describe the number and type of roots for the equation.

a.  $7x^2 - 11x + 5 = 0$

b.  $x^2 + 22x + 121 = 0$

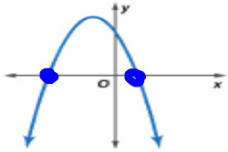
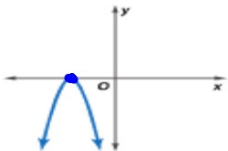
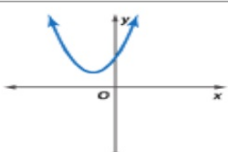

$$(-11)^2 - 4 \cdot 7 \cdot 5$$

$$121 - 140$$

$$d = -19$$

**KeyConcept Discriminant**

Consider  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are rational numbers and  $a \neq 0$ .

Value of Discriminant	Type and Number of Roots	Example of Graph of Related Function
$b^2 - 4ac > 0$ ; $b^2 - 4ac$ is a perfect square.	2 real, rational roots	
$b^2 - 4ac > 0$ ; $b^2 - 4ac$ is not a perfect square.	2 real, irrational roots	
$b^2 - 4ac = 0$	1 real rational root	
$b^2 - 4ac < 0$	2 complex roots	

double root

**Solve:**  
**Guided**Practice

5A.  $-5x^2 + 8x - 1 = 0$

*discrim. + N.O.R.*

5B.  $-7x + 15x^2 - 4 = 0$

**ConceptSummary Solving Quadratic Equations**

Method	Can be Used	When to Use
graphing	sometimes	Use only if an exact answer is not required. Best used to check the reasonableness of solutions found algebraically.
factoring	sometimes	Use if the constant term is 0 or if the factors are easily determined. Example $x^2 - 7x = 0$
Square Root Property	sometimes	Use for equations in which a perfect square is equal to a constant. Example $(x - 5)^2 = 18$
completing the square	always	Useful for equations of the form $x^2 + bx + c = 0$ , where $b$ is even. Example $x^2 + 6x - 14 = 0$
Quadratic Formula	always	Useful when other methods fail or are too tedious. Example $2.3x^2 - 1.8x + 9.7 = 0$





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