

Algebra 1 9.5

Use the quadratic formula to solve equations

Use the discriminant to determine the number and type of roots
quadratic

standard form

→ discriminant

$$b^2 - 4ac$$

$$d = + \quad 2$$

$$d = 0 \quad 1$$

$$d = - \quad \text{no sol.}$$

KeyConcept The Quadratic Formula

The solutions of a quadratic equation $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by the Quadratic Formula.

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

Guided Practice

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

2A. $4x^2 - 24x + 35 = 0$

$a=4, b=-24, c=35$

Solve

2B. $3x^2 - 2x - 9 = 0$

$$\begin{aligned} x &= \frac{-(-24) \pm \sqrt{(-24)^2 - 4 \cdot 4 \cdot 35}}{2 \cdot 4} = \frac{24 \pm \sqrt{576 - 560}}{8} \\ &= \frac{24 \pm \sqrt{16}}{8} = \frac{24 \pm 4}{8} = \frac{28}{8} \quad \frac{20}{8} \\ &\quad x = 3.5 \quad x = 2.5 \end{aligned}$$

$$3x^2 - 2x - 9 = 0$$

$$a=3 \quad b=-2 \quad c=-9$$

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

$$= \frac{2 \pm \sqrt{(-2)^2 - 4 \cdot 3 \cdot (-9)}}{2 \cdot 3} = \frac{2 \pm \sqrt{4 + 108}}{6} = \frac{2 \pm \sqrt{112}}{6}$$

$$\frac{2 \pm 10.6}{6} = \frac{2 + 10.6}{6} = 2.1$$

$$\frac{2 - 10.6}{6} = -1.4$$

What are some methods of solving?

1. graph
2. CTS
- ③. QF
4. SRP

Guided Practice

Solve each equation.

3A. $2x^2 - 17x + 8 = 0$

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

3B. $4x^2 - 4x - 11 = 0$

41. $2h = -0.2n^2 + 7.2n + 1.5$ (1990)

$$\begin{array}{r} 0.2 = -0.2n^2 + 7.2n + 1.5 \\ -0.2 \quad \quad \quad -0.2 \\ \hline 0 = -0.2n^2 + 7.2n + 1.3 \end{array}$$

$$a = -0.2 \quad b = 7.2 \quad c = 1.3$$

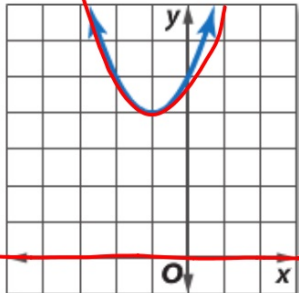
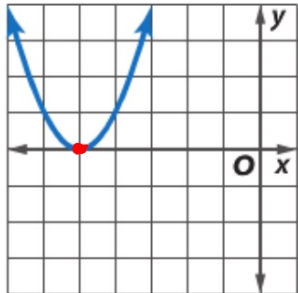
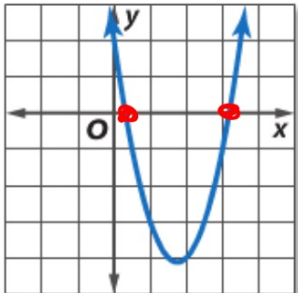
$$x = \frac{-7.2 \pm \sqrt{7.2 \cdot 7.2 - 4 \cdot (-0.2) \cdot 1.3}}{2 \cdot (-0.2)} = \frac{-7.2 \pm \sqrt{51.84 + 1.04}}{-0.4}$$

$$= \frac{-7.2 \pm \sqrt{52.88}}{-0.4} = \frac{-7.2 \pm 7.3}{-0.4}$$

$$\begin{array}{r} 1990 \\ + 36 \\ \hline 2026 \end{array}$$

$$\begin{array}{r} -7.2 + 7.3 \\ -0.4 \end{array} = \cancel{-0.25} \quad \begin{array}{r} -7.2 - 7.3 \\ -0.4 \end{array} = 36.25$$

$$b^2 - 4ac$$

 KeyConcept Using the Discriminant			
Equation	$x^2 + 2x + 5 = 0$	$x^2 + 10x + 25 = 0$	$2x^2 - 7x + 2 = 0$
Discriminant	$b^2 - 4ac = -16$ negative	$b^2 - 4ac = 0$ zero	$b^2 - 4ac = 33$ positive
Graph of Related Function	 0 x-intercepts	 1 x-intercept	 2 x-intercepts
Real Solutions	0	1	2

Example 4 Use the Discriminant

State the value of the discriminant of $4x^2 + 5x = -3$. Then determine the number of real solutions of the equation.

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

$a=4$ $b=5$ $c=3$

$$\begin{aligned} b^2 - 4ac \\ 5 \cdot 5 - 4 \cdot 4 \cdot 3 \\ 25 - 48 \\ = -23 \end{aligned}$$

Guided Practice

4A. $2x^2 + 11x + 15 = 0$

$a=2$ $b=11$ $c=15$

$b^2 - 4ac$

$11 \cdot 11 - 4 \cdot 2 \cdot 15$

$121 - 120$

$d=1$ 2 sol.

4B. $9x^2 - 30x + 25 = 0$

$a=9$ $b=-30$ $c=25$

$-30 \cdot -30 - 4 \cdot 9 \cdot 25$

$= 900 - 900$

$d = 0$

1 sol.

28. p. 587

$$0 = -16t^2 + 64t - 60$$

ft. sec sec
 ↓ ↓

$a = -16 \quad b = 64 \quad c = -60$

$$\frac{19}{23} \cdot 5$$

WB 9.5 prac.
 odds + 26