UNIT 9

Isaac Newton

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9.1

Quadratic Equations: Taking the Square Root of Both Sides

The quadratic equation in standard form is $ax^2 + bx + c = 0$. Some quadratic equations such as $x^2 - 7 = 0$ are missing the bx term. They can be solved by moving the constant to the opposite side of the equation and taking the square root of both sides.

When used to show the square root of a number, the radical sign refers only to the positive square root ($\sqrt{4} = +2$). However, when using a square root in an equation, both positive and negative roots are solutions. This is shown by putting ± in front of the root.

Example 1 **Solve the equation: $x^2 - 7 = 0$.**

$x^2 - 7 = 0$	Original equation.
$x^2 = 7$	Constant moved to the other side of the equation.
$\sqrt{x^2} = \pm\sqrt{7}$	Square root taken of both sides.
$x = \pm\sqrt{7}$	Simplified.
$x = \sqrt{7}$ and $x = -\sqrt{7}$	Solutions.

Example 2 **Solve the equation: $x^2 - 81 = 0$.**

$x^2 - 81 = 0$	Original equation.
$x^2 = 81$	Constant moved to the other side of the equation.
$\sqrt{x^2} = \pm\sqrt{81}$	Square root taken of both sides.
$x = \pm 9$	Simplified.
$x = 9$ and $x = -9$	Solutions.

In Lesson 8.9, quadratic equations such as $x^2 - 81 = 0$ were solved by factoring. They also have a missing bx term and can be solved using the method taught in this lesson.

Example 3 **Solve the equation: $(x - 5)^2 = 9$.**

$(x - 5)^2 = 9$	Original equation.
$\sqrt{(x - 5)^2} = \pm\sqrt{9}$	Square root taken of both sides.
$x - 5 = \pm 3$	Simplified.
$x - 5 = 3$ $x = 8$	Solved to find both roots, 3 and –3.
$x - 5 = -3$ $x = 2$	
$x = 8$ and $x = 2$	Solutions.

Example 4 **Solve the equation: $x^2 = -36$.**

$x^2 = -36$ Original equation.

$\sqrt{x^2} = \pm\sqrt{-36}$ This is not possible because the square root of a negative number cannot be taken.

There are no real-number solutions for this equation. The answer is ø.

Today's Lesson

Solve the quadratic equations for *x* by taking the square root of both sides.

1. $x^2 = 100$

2. $x^2 = 11$

3. $x^2 - 49 = 0$

4. $9x^2 = 49$

5. $(x + 1)^2 = 25$

6. $x^2 = c^2$

REVIEW

Divide. 8.14

7. $(9x^3 - 18x^2 + 35x - 18) \div (3x - 2)$

8. $(5x^3 - 14x^2 + 2x - 22) \div (5x^2 + x + 5)$

Simplify. 5.3

9. $\sqrt{5} \cdot 2\sqrt{5}$

10. $\sqrt[3]{4} \cdot 4\sqrt[3]{24}$

11. $6\sqrt[3]{2} \cdot 2\sqrt[3]{3}$

Divide. 8.7

12. $(3x^2 - 2x + 8) \div (x + 1)$

13. $\dfrac{4b^2 + 4b - 14}{2b + 4}$

Lesson 9.1

Factor the polynomials. 5.14, 6.2, 7.7

14. $16y^2 - 24y + 9$

15. $81x^2 - 16$

16. $12x^2 + x - 6$

Factor by grouping. 7.2

17. $8rs + 4r - 6s - 3$

18. $2mn + 5n - 4m - 10$

19. $6mn + 9m - 2n - 3$

Factor the polynomials completely. 8.1

20. $x^2yz^2 - 4xyz^2 + xz$

21. $15g^2 + 27gh - 6h^2$

22. $3 - 3w^4$

Simplify the expressions. 6.9

23. $\frac{2 - x}{x^2 - 4}$

24. $\frac{x^2 - 3x}{x^2 + 2x - 15}$

25. $\frac{12\,xy^2}{42y^5z}$

Solve the systems of equations by using the multiplication/addition method. 7.1

26. $\begin{cases} 2x - 3y = 5 \\ 3x + 2y = 14 \end{cases}$

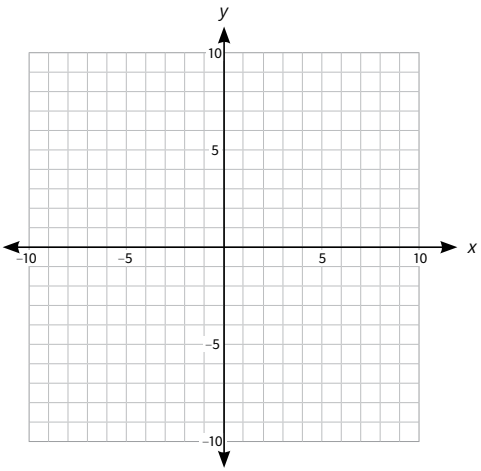
27. $\begin{cases} 3x - 5y = -34 \\ 2x - 9y = -51 \end{cases}$

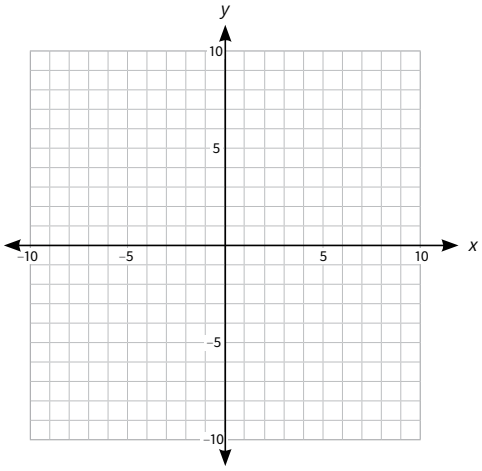
28. $\begin{cases} 5x + 2y = 2 \\ 3x - 5y = -36 \end{cases}$

Graph each of the equations by the *x*- and *y*-intercepts or origin and slope. 6.1

29. $4x + 3y = -6$

30. $7x + 4y = 14$

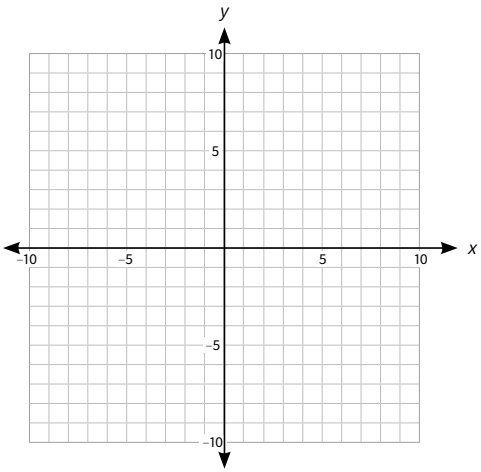


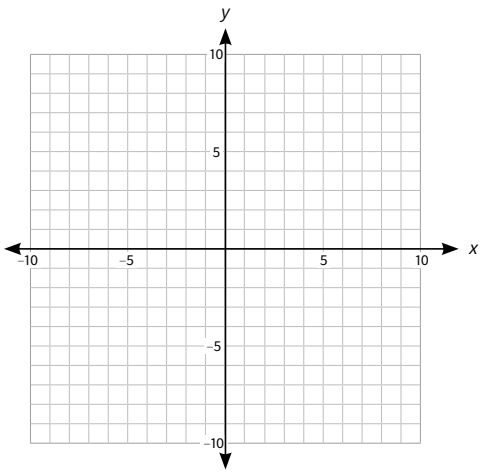


Graph these systems of inequalities. 8.4

31. $y \leq 8x + 7$ and $4y < x + 24$

32. $y \leq 4$, $y \geq 2$, and $y < x + 6$





Determine if the sets of ordered pairs are functions. 8.13

33. {(Sam, 5) (Chuck, 5) (Ellen, 4) (Chris, 7)}

34. {(51, 42) (15, 24) (11, 16) (51, 24)}

Use a system of equations to solve the problems. 8.12

35. In a certain neighborhood there are 48 more children than there are adults. If the population of the neighborhood is 240, how many adults and children are there?

36. A pair of numbers totals 153, and one of the numbers is eight times larger than the other. What are the numbers?

Solve using formulas. 7.11

37. During this school year, Matthew decided to teach his 14-year-old son Jeremy the value of investing money by offering him a 5% return rate if he would deposit a lump sum from his latest summer earnings until the end of the 9-month school year. Another father in the community, Randy, did the same with his 12-year-old son Micah, but used a 4% rate. Together the boys invested $910 for a total end-of-school return of $31.50. How much did each boy invest?

Today's Lesson

Solve the quadratic equations for *x* by taking the square root of both sides.

38. $x^2 = 49$

39. $9x^2 - 36 = 0$

40. $(x + 8)^2 = 10$

Extra Practice

Solve the quadratic equations for *x* by taking the square root of both sides.

41. $x^2 = 144$

42. $4x^2 = 64$

43. $(x - 9)^2 = 9$