

8.3 Quadratic Equations

Basics of Quadratic Equations
The Square Root Property
Completing the Square
Solving an Equation for a Variable
Applications of Quadratic Equations

Key Terms

Use the vocabulary terms listed below to complete the statements in exercises 1-2.

quadratic equation
square root property

1. A(n) _____ can be written as $ax^2 + bx + c = 0$, where a , b , and c are constants with $a \neq 0$.
2. The _____ states that if $x^2 = k$, for $k \geq 0$, then $x = \pm\sqrt{k}$.

Basics of Quadratic Equations

Exercises 1-5: Solve the quadratic equation.

1. $2x^2 + 5 = 0$ 1. _____
2. $x^2 + x - 6 = 0$ 2. _____
3. $x^2 + 1 = 2x$ 3. _____
4. $2x^2 - 5x = 3$ 4. _____
5. $-2x^2 - 6 = 2$ 5. _____

The Square Root Property*Exercises 6-10: Solve the quadratic equation.*

6. $x^2 = 9$

6. _____

7. $x^2 = 8$

7. _____

8. $4x^2 - 25 = 0$

8. _____

9. $(x + 3)^2 = 16$

9. _____

10. $3(2x - 1)^2 = 9$

10. _____

11. An object falls from a height of 80 feet. How long does it take the object to hit the ground?

11. _____

Completing the Square

Exercises 12-15: For each problem, do the following.

(a) Find the term that should be added to the expression to form a perfect square trinomial.

(b) Write the resulting perfect square trinomial in factored form.

12. $x^2 + 8x$

12. (a) _____

(b) _____

13. $x^2 + 3x$

13. (a) _____

(b) _____

14. $x^2 - 20x$

14. (a) _____

(b) _____

15. $x^2 - x$

15. (a) _____

(b) _____

Exercises 16-23: Solve by completing the square.

16. $x^2 - 2x = 8$

16. _____

17. $x^2 + 4x - 3 = 0$

17. _____

18. $x^2 + 3x = 6$

18. _____

19. $x^2 - 5x + 2 = 0$

19. _____

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20. $2x^2 + 6x = 8$

20. _____

21. $2x^2 - 5x = 4$

21. _____

22. $4x^2 + 8x - 10 = 0$

22. _____

23. $9x^2 - 6x - 2 = 0$

23. _____

Solving an Equation for a Variable*Exercises 24-28: Solve each equation for the specified variable.*

24. $A = \pi r^2$, for r 24. _____
(Hint: $r \geq 0$.)

25. $a^2 + b^2 = c^2$, for a 25. _____
(Hint: $a \geq 0$.)

26. $x = 9y^2 + 1$, for y 26. _____

27. $r = s^2 - 4$, for s 27. _____

28. $V = \pi r^2 h$, for r 28. _____
(Hint: $r \geq 0$.)

Applications of Quadratic Equations

- 29.** Find a safe speed limit x for a curve with a radius of 200 feet by using the equation $R = \frac{1}{2}x^2$. **29.** _____
- 30.** The function $f(x) = 0.0066x^2 - 23.76x + 21,389$ models the population of the United States in millions from 1800 through 2000, where $x = 1800$ corresponds to the year 1800, etc. Determine the population of the United States in the year 1950. **30.** _____