3 Chapter Review WITH CalcChat®

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Chapter Learning Target Understand quadratic equations and complex numbers.

Chapter Success Criteria
- ◆ I can perform operations with complex numbers.
- ◆ I can solve quadratic equations by completing the square.
- ■ I can describe how to use the Quadratic Formula.
- ■ I can solve nonlinear systems and quadratic inequalities.

◆ Surface ■ Deep

SELF-ASSESSMENT 1 I do not understand. 2 I can do it with help. 3 I can do it on my own. 4 I can teach someone else.

3.1 Solving Quadratic Equations *(pp. 89–98)*

WATCH

Learning Target: Solve quadratic equations graphically and algebraically.

Vocabulary
quadratic equation in one variable
root of an equation
zero of a function

Solve the equation using any method. Explain your choice of method.

1. $6x^2 = 150$

2. $3x^2 - 4 = 8$

3. $x^2 + 6x - 16 = 0$

4. $2x^2 - 17x = -30$

5. A Rube Goldberg machine drops a ball from a 3-foot-tall table. Write a function that represents the height h (in feet) of the ball t seconds after it is dropped. How long is the ball in the air?

6. For each case, determine whether it is possible for $ax^2 + bx + c = 0$ to have no solutions. Explain your reasoning.

a. $a > 0, c > 0$

b. $a > 0, c < 0$

c. $a < 0, c > 0$

d. $a < 0, c < 0$

7. A rectangular enclosure at a zoo is 35 feet long by 18 feet wide. The zoo doubles the area of the enclosure by adding the same distance to the length and width. What are the new dimensions of the enclosure?

3.2 Complex Numbers *(pp. 99–108)*

WATCH

Learning Target: Understand the imaginary unit i and perform operations with complex numbers.

Vocabulary
imaginary unit i
complex number
imaginary number
pure imaginary number
complex conjugates

8. Find the values of x and y that satisfy the equation $36 - yi = 4x + 3i$.a

Perform the operation. Write the answer in standard form.

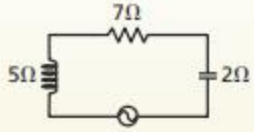
9. $(-2 + 3i) + (7 - 6i)$

10. $(9 + 3i) - (-2 - 7i)$

11. $(5 + 6i)(-4 + 7i)$

12. $(8 + 2i)(8 - 2i)$

13. Find the impedance of the series circuit.



14. Solve $7x^2 + 21 = 0$.

15. Find the zeros of $f(x) = 2x^2 + 32$.

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3.3 Completing the Square *(pp. 109–116)* WATCH

Learning Target: Solve quadratic equations and rewrite quadratic functions by completing the square.

Vocabulary VOCAB
completing the square

Solve the equation using square roots or by completing the square. Explain your choice of method.

16. $x^2 + 6x + 9 = 49$

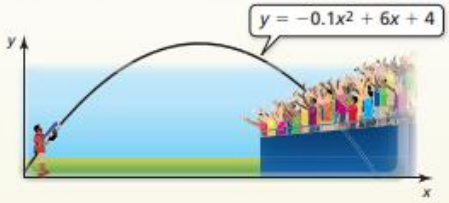
17. $x^2 + 16x + 17 = 0$

18. $4x^2 + 16x + 25 = 0$

19. $9x(x - 6) = 81$

20. Write $y = x^2 - 2x + 20$ in vertex form. Then identify the vertex.

21. The path of a T-shirt launched from a T-shirt cannon is modeled by the function shown, where x is the horizontal distance (in feet) and y is the vertical distance (in feet). Find the maximum height of the T-shirt.



22. You plant a rectangular garden with an area of 80 square feet. You use 40 feet of fencing to enclose three sides of the garden. The fourth side is formed by the side of a shed. Find all possible dimensions of the garden.

3.4 Using the Quadratic Formula *(pp. 117–126)* WATCH

Learning Target: Solve and analyze quadratic equations using the Quadratic Formula and discriminants.

Vocabulary VOCAB
Quadratic Formula
discriminant

Solve the equation using the Quadratic Formula.

23. $-x^2 + 5x = 2$

24. $2x^2 + 5x = 3$

25. $-x^2 + 3x = 2.25$

26. $3x^2 - 12x + 13 = 0$

Find the discriminant of the quadratic equation and describe the number and type of solutions of the equation.

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

28. $x^2 - 2x - 9 = 0$

29. $x^2 + 6x + 5 = 0$

30. Find a pair of integer values for a and c so that the equation $ax^2 + 12x = -c$ has exactly one real solution. Then write the equation.

31. Write a quadratic equation that has solutions $\frac{3 \pm \sqrt{-131}}{10}$.

32. A researcher studies the *generality* of plant and ant species on Mount Wilhelm in Papua New Guinea. Generality is the number of plant species per ant species. The generality can be modeled by the function $g(x) = 0.000004x^2 - 0.0119x + 10.605$, where x is the elevation (in meters). At what elevation(s) do you expect to find a generality of 3 plant species per ant species?

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3.5 Solving Nonlinear Systems of Equations *(pp. 127–134)* WATCH

Learning Target: Solve nonlinear systems graphically and algebraically.

Vocabulary

system of nonlinear equations

Solve the system by any method. Explain your choice of method.

33. $2x^2 - 2 = y$
$-2x + 2 = y$

34. $x^2 - 6x + 13 = y$
$-y = -2x + 3$

35. $x^2 + y^2 = 4$
$-15x + 5 = 5y$

36. Solve $-3x^2 + 5x - 1 = 5x^2 - 8x - 3$ by graphing.

37. The graph of quadratic function f has a vertex at $(2, 5)$ and a y-intercept of 1. The graph of linear function g has a slope of $-\frac{1}{2}$ and passes through the point $(8, -3)$. Solve $f(x) = g(x)$.

3.6 Quadratic Inequalities *(pp. 135–142)* WATCH

Learning Target: Graph quadratic inequalities in two variables and solve quadratic inequalities in one variable.

Vocabulary

quadratic inequality in two variables
system of quadratic inequalities
quadratic inequality in one variable

Graph the inequality.

38. $y > x^2 + 8x + 16$

39. $y \geq x^2 + 6x + 8$

40. $x^2 + y \leq 7x - 12$

Graph the system of quadratic inequalities.

41. $x^2 - 4x + 8 > y$
$-x^2 + 4x + 2 \leq y$

42. $2x^2 - x \leq y + 5$
$0.5x^2 > y - 2x - 1$

Solve the inequality.

43. $3x^2 + 3x - 60 \geq 0$

44. $-x^2 - 10x < 21$

45. $3x^2 + 2 \leq 5x$

46. For each point, complete the inequality with $<$, $\leq$, $\geq$, or $>$ so that the point is a solution of the inequality. Justify your answers.

$$4x^2 - 3x \square y + 6$$

a. $(-1, -1)$ **b.** $(1, -4)$ **c.** $(2, 4)$

Mathematical Practices

Make Sense of Problems and Persevere in Solving Them

Mathematically proficient students plan a solution pathway rather than simply jumping into a solution attempt.

1. In Exercise 64 on page 96, why is it necessary to understand the problem and make a plan before solving? How does stating the given information and describing how it is related help you make a plan to solve the problem?

2. Make a plan that you can use to find the possible widths of the fountain in Exercise 43 on page 141.