

Quadratic Functions

Exercises 11–16, find the vertex and axis of symmetry of the parabola. See margin.

11. $y = -2x^2 + 5x - 10$

12. $y = 3x^2 + 6x - 2$

13. $y = 4x^2 - 2x + 1$

14. $y = -x^2 - 2x - 3$

15. $y = 10x^2 - 20x - 15$

16. $y = 7x^2 + 2x - 10$

In Exercises 23–28, match the equation with its graph.

23. $y = x^2 - 2$ b

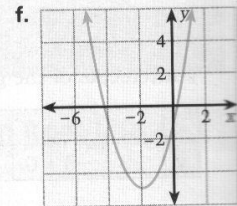
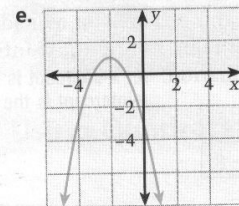
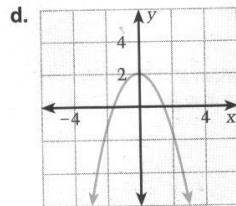
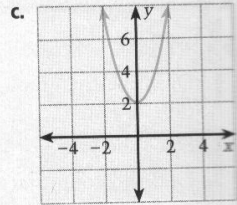
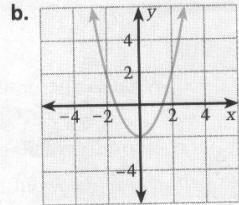
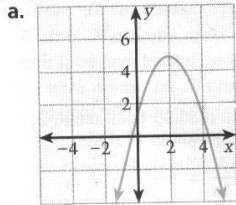
24. $y = x^2 + 4x - 1$ f

25. $y = -x^2 - 4x - 3$ e

26. $y = x^2 + 2$ c

27. $y = -x^2 + 4x + 1$ a

28. $y = -x^2 + 2$ d



In Exercises 29–40, sketch the graph of the equation. See Additional Answers.

29. $y = x^2 - 2x + 6$

30. $y = x^2 + 8x + 16$

31. $y = -x^2 + 6x - 9$

32. $y = -x^2 - 2x - 3$

33. $y = x^2 + 14x + 45$

34. $y = x^2 - 4x + 7$

35. $y = -\frac{1}{4}x^2 + 4$

36. $y = \frac{1}{4}x^2 - 4$

37. $y = -\frac{1}{4}x^2 + x + 3$

38. Sketch the graphs and then find the vertex. Can it be found without using the vertex formula?

a. $y = (x - 2)^2 + 3$ (2, 3)

b. $y = (x - 6)^2 - 2$ (6, -2)

c. $y = (x + 3)^2 + 1$ (-3, 1)

d. $y = (x + 4)^2 - 5$ (-4, -5)

Quadratic Equations

In Exercises 1–6, factor the trinomial.

1. $x^2 + 3x - 4$

2. $x^2 - 5x + 6$

3. $y^2 - 16y - 36$

4. $x^2 - 10x + 24$

5. $x^2 + 15x + 50$

6. $y^2 + 30y + 216$

In Exercises 7–12, write the trinomial as the square of a binomial.

7. $x^2 - 2x + 1$ $(x - 1)^2$

8. $x^2 + 24x + 144$ $(x + 12)^2$

10. $x^2 + \frac{4}{3}x + \frac{4}{9}$ $(x + \frac{2}{3})^2$

11. $x^2 - x + \frac{1}{4}$ $(x - \frac{1}{2})^2$

In Exercises 13–18, solve the equation by completing the square.

13. $x^2 + 10x + 24 = 0$ -6, -4

14. $x^2 - 4x + 3 = 0$ 1, 3

16. $x^2 + 4x - 1 = 0$ $-2 \pm \sqrt{5}$

17. $x^2 + 6x - 4 = 0$ $-3 \pm \sqrt{13}$

$(x + 7)^2$
9. $x^2 + 14x + 49$
12. $x^2 - 12x + 36$ $(x - 6)^2$

-3, 5
15. $x^2 - 2x - 15 = 0$
18. $x^2 - 2x - 5 = 0$ $1 \pm \sqrt{6}$

Exercises 21–30, use the quadratic formula to solve the equation.

21. $-5x^2 - 15x + 10 = 0$ $-\frac{3}{2} \pm \frac{\sqrt{425}}{10}$

22. $4x^2 - 6x + 2 = 0$ $1, \frac{1}{2}$

23. $-9x - 1 = -9x^2$ $\frac{1}{2} \pm \frac{\sqrt{117}}{18}$

24. $10x^2 - 5x + 5 = -25x$ $-1 \pm \frac{\sqrt{200}}{20}$

25. $-13x^2 - 9x + 4 = 5 + 2x^2 - x$ $-\frac{1}{3}, -\frac{1}{5}$

26. $7x^2 + x = 12x^2 - 3x + 2$ No real solution.

27. $11x^2 + 4 = 2 - 7x^2 + 11x$ No real solution.

28. $x - x^2 = 1 - 6x^2$ $-\frac{1}{10} \pm \frac{\sqrt{21}}{10}$

29. $4x - 2 = -3x^2 + 3x$ $-1, \frac{2}{3}$

30. $12x^2 - 9x + 1 = 10x^2 + 10x + 7$ $\frac{19}{4} \pm \frac{\sqrt{409}}{4}$

Exercises 31–34, solve the equation. Round to two decimal places.

31. $5.1x^2 - 0.33x - 0.1 = 0$ 0.18, -0.11

32. $6.3x^2 + 10.08x + 0.99 = 0$ -0.11, -1.49

33. $3.2x^2 - 0.01 = 15.1 + 3.3x$ 2.75, -1.72

34. $17.02x - 3x^2 = 4.01x^2 - 1.5$ 2.51, -0.09

In Exercises 35–38, find values of c such that the equation has two real-number solutions, one real-number solution, and no real-number solution. See margin.

35. $x^2 - 6x + c = 0$

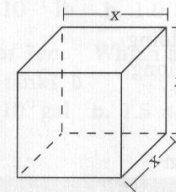
36. $x^2 - 12x + c = 0$

37. $x^2 + 8x + c = 0$

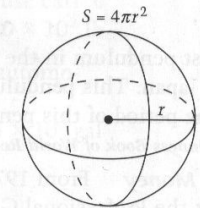
38. $x^2 + 2x + c = 0$

Problems from Geometry

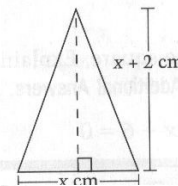
Geometry The surface area of a cube is 326 square meters. How long is each edge? ≈ 7.37 m



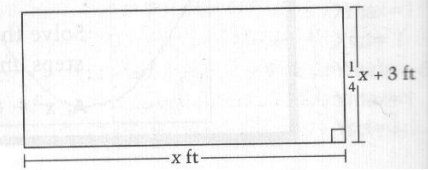
Geometry The surface area of a sphere is 576π square inches. Find the radius. 12 in.



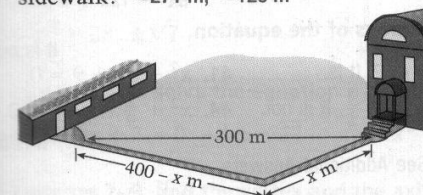
25. Triangle Area = 12 cm² 4 cm, 6 cm



26. Rectangle Area = 160 ft² 20 ft, 8 ft



7. Cutting across the Lawn On the sidewalk, the walk from the high school to the junior high school is 400 meters. By cutting across the lawn, the walking distance is shortened to 300 meters. How long is each part of the L-shaped sidewalk? ≈ 271 m, ≈ 129 m



28. More Grass to Mow Your home is built on a square lot. To add more space to your yard, you purchase an additional 4 feet along the side of the property. The area of the lot is now 9600 square feet. What are the dimensions of the new lot? 96 ft by 100 ft

