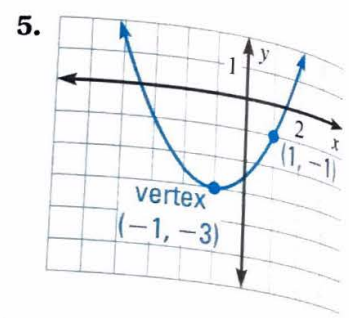
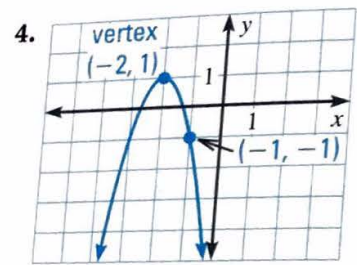
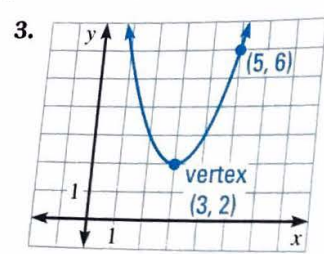


SKILL PRACTICE

- VOCABULARY** Copy and complete: When you perform quadratic regression on a set of data, the quadratic model obtained is called the ?.
- ★ WRITING** Describe how to write an equation of a parabola if you know three points on the parabola that are not the vertex or x -intercepts.

EXAMPLE 1
 on p. 309
 for Exs. 3–15

WRITING IN VERTEX FORM Write a quadratic function in vertex form for the parabola shown.



WRITING IN VERTEX FORM Write a quadratic function in vertex form whose graph has the given vertex and passes through the given point.

- | | | |
|------------------------------------------|--------------------------------------------|--------------------------------------------|
| 6. vertex: $(-4, 1)$
point: $(-2, 5)$ | 7. vertex: $(1, 6)$
point: $(-1, 2)$ | 8. vertex: $(5, -4)$
point: $(1, 20)$ |
| 9. vertex: $(-3, 3)$
point: $(1, -1)$ | 10. vertex: $(5, 0)$
point: $(2, -27)$ | 11. vertex: $(-4, -2)$
point: $(0, 30)$ |
| 12. vertex: $(2, 1)$
point: $(4, -2)$ | 13. vertex: $(-1, -4)$
point: $(2, -1)$ | 14. vertex: $(3, 5)$
point: $(7, -3)$ |

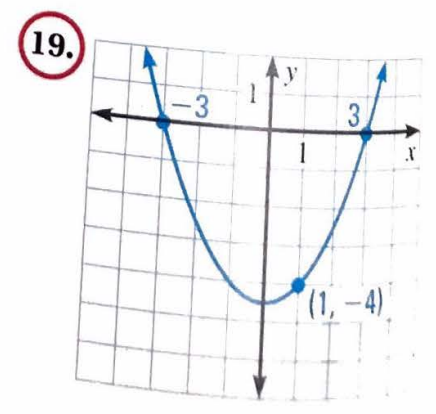
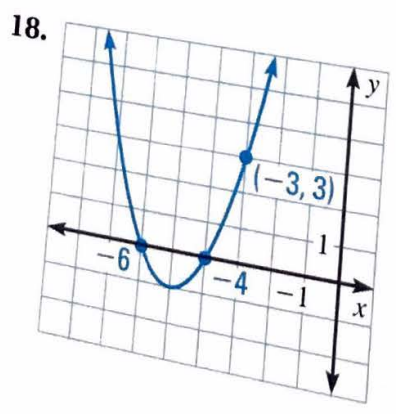
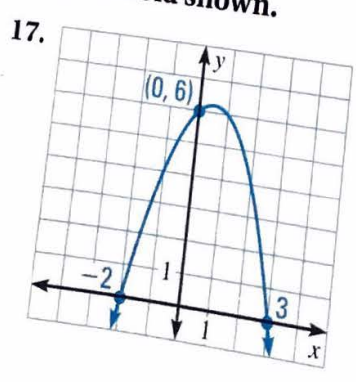
15. **★ MULTIPLE CHOICE** The vertex of a parabola is $(5, -3)$ and another point on the parabola is $(1, 5)$. Which point is also on the parabola?

- (A) $(0, 3)$ (B) $(-1, 9)$ (C) $(-1, 15)$ (D) $(7, 7)$

16. **★ MULTIPLE CHOICE** The x -intercepts of a parabola are 4 and 7 and another point on the parabola is $(2, -20)$. Which point is also on the parabola?

- (A) $(1, 21)$ (B) $(8, -4)$ (C) $(5, -40)$ (D) $(5, 4)$

WRITING IN INTERCEPT FORM Write a quadratic function in intercept form for the parabola shown.



WRITING IN INTERCEPT FORM Write a quadratic function in intercept form whose graph has the given x -intercepts and passes through the given point.

20. x -intercepts: 2, 5
point: (4, -2)

21. x -intercepts: -3, 0
point: (2, 10)

22. x -intercepts: -1, 4
point: (2, 4)

23. x -intercepts: 3, 7
point: (6, -9)

24. x -intercepts: -5, -1
point: (-7, -24)

25. x -intercepts: -6, 3
point: (0, -9)

ERROR ANALYSIS Describe and correct the error in writing a quadratic function whose graph has the given x -intercepts or vertex and passes through the given point.

26. x -intercepts: 4, -3; point: (5, -5)

$$y = a(x - 5)(x + 5)$$

$$-3 = a(4 - 5)(4 + 5)$$

$$-3 = -9a$$

$$\frac{1}{3} = a, \text{ so } y = \frac{1}{3}(x - 5)(x + 5)$$

27. vertex: (2, 3); point: (1, 5)

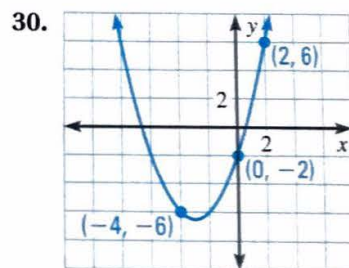
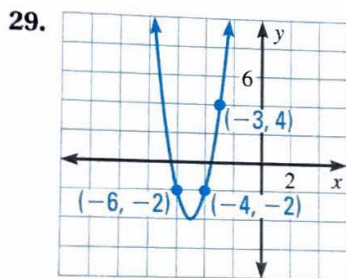
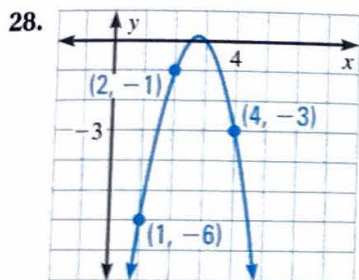
$$y = a(x - 2)(x - 3)$$

$$5 = a(1 - 2)(1 - 3)$$

$$5 = 2a$$

$$\frac{5}{2} = a, \text{ so } y = \frac{5}{2}(x - 2)(x - 3)$$

WRITING IN STANDARD FORM Write a quadratic function in standard form for the parabola shown.



WRITING IN STANDARD FORM Write a quadratic function in standard form for the parabola that passes through the given points.

31. (-4, -3), (0, -2), (1, 7)

32. (-2, -4), (0, -10), (3, -7)

33. (-2, 4), (0, 5), (1, -11)

34. (-1, -1), (1, 11), (3, 7)

35. (-1, 9), (1, 1), (3, 17)

36. (-6, -1), (-3, -4), (3, 8)

37. (-2, -13), (2, 3), (4, 5)

38. (-6, 29), (-4, 12), (2, -3)

39. (-3, -2), (3, 10), (6, -2)

WRITING QUADRATIC FUNCTIONS Write a quadratic function whose graph has the given characteristics.

40. passes through:
(-0.5, -1), (2, 8), (11, 25)

41. x -intercepts: -11, 3
passes through: (1, -192)

42. vertex: (4.5, 7.25)
passes through: (7, -3)

43. **★ OPEN-ENDED MATH** Draw a parabola that passes through (-2, 3). Write a function for the parabola in standard form, intercept form, and vertex form.

44. **★ SHORT RESPONSE** Suppose you are given a set of data pairs (x, y) . Describe how you can use ratios to determine whether the data can be modeled by a quadratic function of the form $y = ax^2$.


45. **CHALLENGE** Find a function of the form $y = ax^2 + bx + c$ whose graph passes through (1, -4), (-3, -16), and (7, 14). Explain what the model tells you about the points.

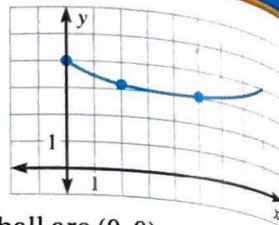
PROBLEM SOLVING

EXAMPLES 1 and 3


on pp. 309–310
for Exs. 46–47

46. **ANTENNA DISH** Three points on the parabola formed by the cross section of an antenna dish are $(0, 4)$, $(2, 3.25)$, and $(5, 3.0625)$. Write a quadratic function that models the cross section.

 for problem solving help at classzone.com



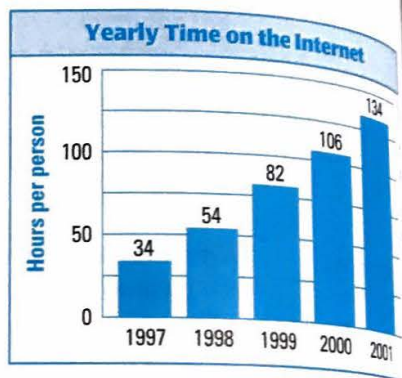
47. **FOOTBALL** Two points on the parabolic path of a kicked football are $(0, 0)$ and the vertex $(20, 15)$. Write a quadratic function that models the path.

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EXAMPLE 4

on p. 311
for Exs. 48–50

48. **MULTI-STEP PROBLEM** The bar graph shows the average number of hours per person per year spent on the Internet in the United States for the years 1997–2001.



- Use a graphing calculator to create a scatter plot.
- Use the quadratic regression feature of the calculator to find the best-fitting quadratic model for the data.
- Use your model from part (b) to predict the average number of hours a person will spend on the Internet in 2010.

49. **RUNNING** The table shows how wind affects a runner's performance in the 200 meter dash. Positive wind speeds correspond to tailwinds, and negative wind speeds correspond to headwinds. The change t in finishing time is the difference between the runner's time when the wind speed is s and the runner's time when there is no wind.

Wind speed (m/sec), s	-6	-4	-2	0	2	4	6
Change in finishing time (sec), t	2.28	1.42	0.67	0	-0.57	-1.05	-1.42



- Use a graphing calculator to find the best-fitting quadratic model.
 - Predict the change in finishing time when the wind speed is 10 m/sec.
50. **MULTIPLE REPRESENTATIONS** The table shows the number of U.S. households (in millions) with color televisions from 1970 through 2000.

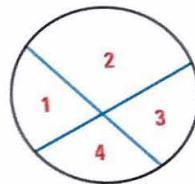
Years since 1970	0	5	10	15	20	25	30
Households with color TVs (millions)	21	47	63	78	90	94	101

- Drawing a Graph** Make a scatter plot of the data. Draw the parabola that you think best fits the data.
- Writing a Function** Estimate the coordinates of three points on the parabola. Use the points to write a quadratic function for the data.
- Making a Table** Use your function from part (b) to make a table of data for the years listed in the original table above. *Compare* the numbers of households given by your function with the numbers in the original table.

51. **★ MULTIPLE CHOICE** The Garabit Viaduct in France has a parabolic arch as part of its support. Three points on the parabola that models the arch are $(0, 0)$, $(40, 38.2)$, and $(165, 0)$ where x and y are measured in meters. Which point is also on the parabola?

(A) $(10, -11.84)$ (B) $(26.74, 25)$ (C) $(80, 51.95)$ (D) $(125, 45)$

52. **CHALLENGE** Let R be the maximum number of regions into which a circle can be divided using n chords. For example, the diagram shows that $R = 4$ when $n = 2$. Copy and complete the table. Then write a quadratic model giving R as a function of n .



n	0	1	2	3	4	5	6
R	?	?	4	?	?	?	?

MISSOURI MIXED REVIEW

TEST PRACTICE at classzone.com

53. Charlie receives some money for his birthday. He deposits one third of the money in the bank. He purchases a concert ticket for \$45. Then he spends half of the remaining money on dinner. Charlie has \$8.50 left. How much money did he receive for his birthday?

(A) \$80 (B) \$93 (C) \$118 (D) \$124

54. Which equation represents a line that is parallel to the line that passes through $(-4, 9)$ and $(5, -3)$?

(A) $-4x + 3y = 29$ (B) $2x + 3y = 9$
 (C) $4x + 3y = -12$ (D) $2x - 3y = 11$

QUIZ for Lessons 4.8–4.10

Use the quadratic formula to solve the equation. (p. 292)

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

2. $2x^2 - 8x + 1 = 0$

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

Graph the inequality. (p. 300)

4. $y < -3x^2$

5. $y > -x^2 + 2x$

6. $y \geq -x^2 + 2x + 3$

Solve the inequality. (p. 300)

7. $0 \geq x^2 + 5$

8. $12 \leq x^2 - 7x$

9. $2x^2 + 2 > -5x$

Write a quadratic function whose graph has the given characteristics. (p. 309)

10. vertex: $(5, 7)$

11. x -intercepts: $-3, 5$
 passes through: $(7, -40)$

12. passes through:
 $(-1, 2), (4, -23), (2, -7)$

13. **SPORTS** A person throws a baseball into the air with an initial vertical velocity of 30 feet per second and then lets the ball hit the ground. The ball is released 5 feet above the ground. How long is the ball in the air? (p. 292)