GUIDED PRACTICE

Vocabulary Check ✓

1. Complete this statement: The graph of a quadratic function is called a(n) ? .

Concept Check ✓

2. Does the graph of $y = 3x^2 - x - 2$ open up or down? Explain.

3. Is $y = -2(x - 5)(x - 8)$ in standard form, vertex form, or intercept form?

Skill Check ✓

Graph the quadratic function. Label the vertex and axis of symmetry.

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

5. $y = 2(x + 1)^2 - 4$

6. $y = -(x + 2)(x - 1)$

7. $y = -\frac{1}{3}x^2 - 2x - 3$

8. $y = -\frac{3}{5}(x - 4)^2 + 6$

9. $y = \frac{5}{2}x(x - 3)$

Write the quadratic function in standard form.

10. $y = (x + 1)(x + 2)$

11. $y = -2(x + 4)(x - 3)$

12. $y = 4(x - 1)^2 + 5$

13. $y = -(x + 2)^2 - 7$

14. $y = -\frac{1}{2}(x - 6)(x - 8)$

15. $y = \frac{2}{3}(x - 9)^2 - 4$

16. **SCIENCE CONNECTION** The equation given in Example 5 is based on temperature preferences of both male and female test subjects. Researchers also analyzed data for males and females separately and obtained the equations below.

Males: $y = -4.290x^2 + 612.6x - 21{,}773$

Females: $y = -6.224x^2 + 908.9x - 33{,}092$

What was the most comfortable temperature for the males? for the females?

PRACTICE AND APPLICATIONS

STUDENT HELP

Extra Practice to help you master skills is on p. 945.

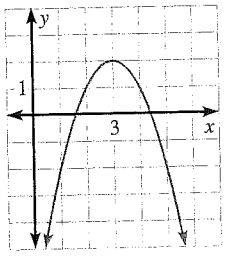
MATCHING GRAPHS **Match the quadratic function with its graph.**

17. $y = (x + 2)(x - 3)$

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

19. $y = x^2 - 6x + 11$

A.



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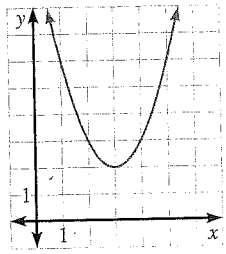

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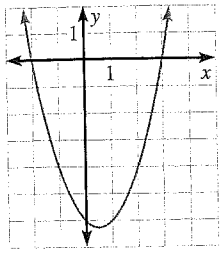


GRAPHING WITH STANDARD FORM **Graph the quadratic function. Label the vertex and axis of symmetry.**

20. $y = x^2 - 2x - 1$

21. $y = 2x^2 - 12x + 19$

22. $y = -x^2 + 4x - 2$

23. $y = -3x^2 + 5$

24. $y = \frac{1}{2}x^2 + 4x + 5$

25. $y = -\frac{1}{6}x^2 - x - 3$

STUDENT HELP

HOMEWORK HELP

Example 1: Exs. 17–25
Example 2: Exs. 17–19, 26–31
Example 3: Exs. 17–19, 32–37
Example 4: Exs. 38–49
Examples 5, 6: Exs. 51–54

GRAPHING WITH VERTEX FORM **Graph the quadratic function. Label the vertex and axis of symmetry.**

26. $y = (x - 1)^2 + 2$

27. $y = -(x - 2)^2 - 1$

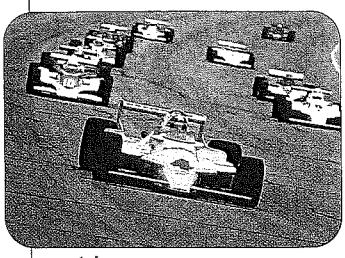
28. $y = -2(x + 3)^2 - 4$

29. $y = 3(x + 4)^2 + 5$

30. $y = -\frac{1}{3}(x + 1)^2 + 3$

31. $y = \frac{5}{4}(x - 3)^2$

FOCUS ON APPLICATIONS



REAL LIFE **TORQUE,** the focus of Ex. 51, is the "twisting force" produced by the crankshaft in a car's engine. As torque increases, a car is able to accelerate more quickly.

INTERNET APPLICATION LINK
www.mcdougallittell.com

GRAPHING WITH INTERCEPT FORM **Graph the quadratic function. Label the vertex, axis of symmetry, and *x*-intercepts.**

32. $y = (x - 2)(x - 6)$ **33.** $y = 4(x + 1)(x - 1)$ **34.** $y = -(x + 3)(x + 5)$

35. $y = \frac{1}{3}(x + 4)(x + 1)$ **36.** $y = -\frac{1}{2}(x - 3)(x + 2)$ **37.** $y = -3x(x - 2)$

WRITING IN STANDARD FORM **Write the quadratic function in standard form.**

38. $y = (x + 5)(x + 2)$ **39.** $y = -(x + 3)(x - 4)$ **40.** $y = 2(x - 1)(x - 6)$

41. $y = -3(x - 7)(x + 4)$ **42.** $y = (5x + 8)(4x + 1)$ **43.** $y = (x + 3)^2 + 2$

44. $y = -(x - 5)^2 + 11$ **45.** $y = -6(x - 2)^2 - 9$ **46.** $y = 8(x + 7)^2 - 20$

47. $y = -(9x + 2)^2 + 4x$ **48.** $y = -\frac{7}{3}(x + 6)(x + 3)$ **49.** $y = \frac{1}{2}(8x - 1)^2 - \frac{3}{2}$

50. **VISUAL THINKING** In parts (a) and (b), use a graphing calculator to examine how b and c affect the graph of $y = ax^2 + bx + c$.

a. Graph $y = x^2 + c$ for $c = -2, -1, 0, 1$, and 2. Use the same viewing window for all the graphs. How do the graphs change as c increases?

b. Graph $y = x^2 + bx$ for $b = -2, -1, 0, 1$, and 2. Use the same viewing window for all the graphs. How do the graphs change as b increases?

51. **AUTOMOBILES** The engine torque y (in foot-pounds) of one model of car is given by

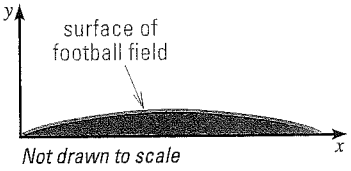
$$y = -3.75x^2 + 23.2x + 38.8$$

where x is the speed of the engine (in thousands of revolutions per minute). Find the engine speed that maximizes torque. What is the maximum torque?

52. **SPORTS** Although a football field appears to be flat, its surface is actually shaped like a parabola so that rain runs off to either side. The cross section of a field with synthetic turf can be modeled by

$$y = -0.000234(x - 80)^2 + 1.5$$

where x and y are measured in feet. What is the field's width? What is the maximum height of the field's surface? ▶ Source: Boston College



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53. **PHYSIOLOGY** Scientists determined that the rate y (in calories per minute) at which you use energy while walking can be modeled by

$$y = 0.00849(x - 90.2)^2 + 51.3, \quad 50 \le x \le 150$$

where x is your walking speed (in meters per minute). Graph the function on the given domain. Describe how energy use changes as walking speed increases. What speed minimizes energy use? ▶ Source: *Bioenergetics and Growth*

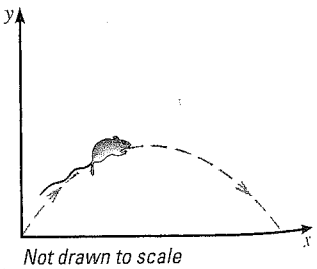
STUDENT HELP

INTERNET HOMEWORK HELP
Visit our Web site www.mcdougallittell.com for help with problem solving in Ex. 54.

54. **BIOLOGY CONNECTION** The woodland jumping mouse can hop surprisingly long distances given its small size. A relatively long hop can be modeled by

$$y = -\frac{2}{9}x(x - 6)$$

where x and y are measured in feet. How far can a woodland jumping mouse hop? How high can it hop?
▶ Source: University of Michigan Museum of Zoology



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