GUIDED PRACTICE

1. **Vocabulary** If the graph of a quadratic function opens upward, the y-value of the vertex is a __?__ value. (*maximum* or *minimum*)

SEE EXAMPLE 1 Identify the axis of symmetry for the graph of each function.

2. $f(x) = -2(x - 2)^2 - 4$ 3. $g(x) = 3x^2 + 4$ 4. $h(x) = (x + 5)^2$

SEE EXAMPLE 2 For each function, (a) determine whether the graph opens upward or downward, (b) find the axis of symmetry, (c) find the vertex, (d) find the y-intercept, and (e) graph the function.

5. $f(x) = -x^2 - 2x - 8$ 6. $g(x) = x^2 - 3x + 2$ 7. $h(x) = 4x - x^2 - 1$

SEE EXAMPLE 3 Find the minimum or maximum value of each function. Then state the domain and range of the function.

8. $f(x) = x^2 - 1$ 9. $g(x) = -x^2 + 3x - 2$ 10. $h(x) = -16x^2 + 32x + 4$

SEE EXAMPLE 4 11. **Sports** The path of a soccer ball is modeled by the function $h(x) = -0.005x^2 + 0.25x$, where h is the height in meters and x is the horizontal distance that the ball travels in meters. What is the maximum height that the ball reaches?

PRACTICE AND PROBLEM SOLVING

For Exercises	See Example
12–14	1
15–23	2
24–29	3
30	4

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Online Extra Practice

Identify the axis of symmetry for the graph of each function.

12. $f(x) = -x^2 + 4$ 13. $g(x) = (x - 1)^2$ 14. $h(x) = 2(x + 1)^2 - 3$

For each function, (a) determine whether the graph opens upward or downward, (b) find the axis of symmetry, (c) find the vertex, (d) find the y-intercept, and (e) graph the function.

15. $f(x) = x^2 + x - 2$ 16. $g(x) = -3x^2 + 6x$ 17. $h(x) = 0.5x^2 - 2x - 4$

18. $f(x) = -2x^2 + 8x + 5$ 19. $g(x) = 3x^2 + 2x - 8$ 20. $h(x) = 2x - 1 + x^2$

21. $f(x) = -(2 + x^2)$ 22. $g(x) = 0.5x^2 + 3x - 5$ 23. $h(x) = \frac{1}{4}x^2 + x + 2$

Find the minimum or maximum value of each function. Then state the domain and range of the function.

24. $f(x) = -2x^2 + 7x - 3$ 25. $g(x) = 6x - x^2$ 26. $h(x) = x^2 - 4x + 3$

27. $f(x) = -\frac{1}{2}x^2 - 4$ 28. $g(x) = -x^2 - 6x + 1$ 29. $h(x) = x^2 + 8x + 16$

30. **Weather** The daily high temperature in Death Valley, California, in 2003 can be modeled by $T(d) = -0.0018d^2 + 0.657d + 50.95$, where T is temperature in degrees Fahrenheit and d is the day of the year. What was the maximum temperature in 2003 to the nearest degree?

31. **Sports** The height of a golf ball over time can be represented by a quadratic function. Graph the data in the table. What is the maximum height that the ball will reach? Explain your answer in terms of the axis of symmetry and vertex of the graph.

Golf Ball Height					
Time (s)	0	0.5	1	2	3
Height (ft)	0	28	48	64	48