

SECTION 2.5 Inequalities Involving Quadratic Functi

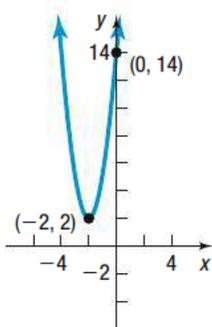


Figure 30 $f(x) = 3x^2 + 12x + 14$

The x -coordinate of the vertex is

$$h = -\frac{b}{2a} = -\frac{12}{2(3)} = -2$$

The y -coordinate of the vertex is

$$k = f\left(-\frac{b}{2a}\right) = f(-2) = 3(-2)^2 + 12(-2) + 14 = 2$$

The vertex is located at the point $(-2, 2)$.

Note that the vertex is located above the x -axis. Therefore, because the parabola opens up, the graph of f has no x -intercepts. Figure 30 shows the graph.

The graph is above the x -axis for all values of x , so the solution is the set of all real numbers or $(-\infty, \infty)$.

Now Work PROBLEM 17

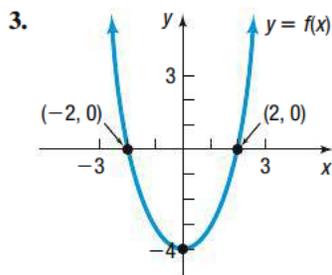
2.5 Assess Your Understanding

'Are You Prepared?' Answers are given at the end of these exercises. If you get a wrong answer, read the pages listed in

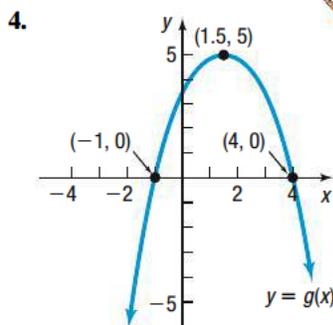
- Solve the inequality $-3x - 2 < 7$. (pp. A87–A89)
- Write $(-2, 7]$ using inequality notation and interval notation. (pp. A84–A85)

Skill Building

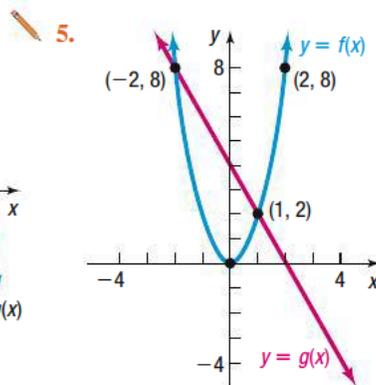
In Problems 3–6, use the figure to solve each inequality.



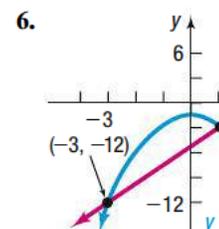
- $f(x) > 0$
- $f(x) \leq 0$



- $g(x) < 0$
- $g(x) \geq 0$



- $g(x) \geq f(x)$
- $f(x) > g(x)$



- $f(x) < g(x)$
- $f(x) \geq g(x)$

In Problems 7–22, solve each inequality.

- | | | | |
|------------------------|------------------------|--------------------------|------------------------|
| 7. $x^2 - 3x - 10 < 0$ | 8. $x^2 + 3x - 10 > 0$ | 9. $x^2 - 4x > 0$ | 10. $x^2 + 8x > 0$ |
| 11. $x^2 - 9 < 0$ | 12. $x^2 - 1 < 0$ | 13. $x^2 + x > 12$ | 14. $x^2 + 7x < -1$ |
| 15. $2x^2 < 5x + 3$ | 16. $6x^2 < 6 + 5x$ | 17. $x^2 - x + 1 \leq 0$ | 18. $x^2 + 2x + 4 < 0$ |
| 19. $4x^2 + 9 < 6x$ | 20. $25x^2 + 16 < 40x$ | 21. $6(x^2 - 1) > 5x$ | 22. $2(2x^2 - 3x) < 0$ |

Mixed Practice

- What is the domain of the function $f(x) = \sqrt{x^2 - 16}$?
- What is the domain of the function $f(x) = \sqrt{x}$?

In Problems 25–32, use the given functions f and g .

- | | | | |
|---|---|--|--|
| (a) Solve $f(x) = 0$. | (b) Solve $g(x) = 0$. | (c) Solve $f(x) = g(x)$. | (d) Solve $f(x) > g(x)$. |
| (e) Solve $g(x) \leq 0$. | (f) Solve $f(x) > g(x)$. | (g) Solve $f(x) \geq 1$. | |
| 25. $f(x) = x^2 - 1$
$g(x) = 3x + 3$ | 26. $f(x) = -x^2 + 3$
$g(x) = -3x + 3$ | 27. $f(x) = -x^2 + 1$
$g(x) = 4x + 1$ | 28. $f(x) = -x^2 + 4$
$g(x) = -x - 2$ |

$$\begin{aligned} 29. \quad & f(x) = x^2 - 4 \\ & g(x) = -x^2 + 4 \end{aligned}$$

$$\begin{aligned} 30. \quad & f(x) = x^2 - 2x + 1 \\ & g(x) = -x^2 + 1 \end{aligned}$$

$$\begin{aligned} 31. \quad & f(x) = x^2 - x - 2 \\ & g(x) = x^2 + x - 2 \end{aligned}$$

$$\begin{aligned} 32. \quad & f(x) = -x^2 - \\ & g(x) = -x^2 + \end{aligned}$$