

Using the graph of $f(x) = x^2$ as a guide, describe the transformations, and then graph each function.

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

2. $g(x) = -4(x - 1)^2$

3. $g(x) = \frac{1}{2}x^2 + 1$

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

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

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

6. $h(x) = x^2 - 6x$

7. A football kick is modeled by the function $h(x) = -0.0075x^2 + 0.5x + 5$, where h is the height of the ball in feet and x is the horizontal distance in feet that the ball travels. Find the maximum height of the ball to the nearest foot.

Find the roots of each equation by factoring.

8. $x^2 - 100 = 0$

9. $x^2 + 5x = 24$

10. $4x^2 + 8x = 0$

Solve each equation by completing the square.

11. $x^2 - 6x = 40$

12. $x^2 + 18x = 15$

13. $x^2 + 14x = 8$

Write each function in vertex form, and identify each vertex.

14. $f(x) = x^2 + 24x + 138$

15. $g(x) = x^2 - 12x + 39$

16. $h(x) = 5x^2 - 20x + 9$

Solve each equation.

17. $3x^2 = -48$

18. $x^2 - 20x = -125$

19. $x^2 - 8x + 30 = 0$

Find the zeros of each function by using the Quadratic Formula.

20. $f(x) = (x + 6)^2 + 2$

21. $g(x) = x^2 + 7x + 15$

22. $h(x) = 2x^2 - 5x + 3$

Simplify. Identify any x-values for which the expression is undefined.

23. $\frac{24x^{14}}{9x^{16}}$

24. $\frac{6x^3}{3x+12}$

25. $\frac{x^2 + x - 12}{x^2 + 5x + 4}$

Multiply. Assume that all expressions are defined.

26. $\frac{x+5}{3x+1} \cdot \frac{9x+3}{x^2-25}$

27. $\frac{x^2+2x-3}{x^2-x-2} \cdot \frac{x-2}{x+3}$

Divide. Assume that all expressions are defined.

28. $\frac{x^3y}{4xy^4} \div \frac{x}{8y^2}$

29. $\frac{x^2+2x-15}{x-2} \div \frac{x^2-9}{2x-4}$

Add/subtract. Identify all x-values for which the expression is undefined.

$$30. \frac{4x}{x^2+4} + \frac{x^2+8}{x^2+4}$$

$$31. \frac{x}{x^2-4} + \frac{1}{x-2}$$

$$32. \frac{x}{x+5} - \frac{5}{x-5}$$

$$33. \frac{2x}{2x+1} - \frac{7}{3x-1}$$

Solve each equation.

$$34. x - \frac{6}{x} = 1$$

$$35. \frac{4x}{x-5} = \frac{3x+5}{x-5}$$

$$36. \frac{x}{x+4} + \frac{x}{2} = \frac{2x}{2x+8}$$

Simplify each expression. Assume that all variables are positive.

$$37. \sqrt[3]{27x^6}$$

$$38. \sqrt[4]{81x^{12}}$$

$$39. \sqrt[3]{\frac{8x^3}{3}}$$

Solve each equation.

$$40. \sqrt{x+6} - 7 = -2$$

$$41. \sqrt{10x} = 3\sqrt{x+1}$$

$$42. \sqrt{x+1} = x-5$$

$$43. (x+3)^{\frac{1}{3}} = -6$$

Solve each inequality.

$$44. \sqrt{x-4} \leq 3$$

$$45. \sqrt{2x+7} - 6 > -1$$

$$46. \sqrt[3]{x-1} > -2$$

Identify the zeros, holes and asymptotes of each function.

$$47. f(x) = \frac{x^2 - 3x}{x + 4}$$

$$48. f(x) = \frac{x - 3}{x^2 + 6x + 5}$$

$$49. f(x) = \frac{x^2 - 3x - 18}{x^2 + 3}$$

$$50. f(x) = \frac{x^2 - 9}{x - 2}$$