5.4

ANSWERS

1. no; The radicand does not contain a variable.
2. First, subtract 10 from both sides of the inequality. Then square each side. Eliminate any solutions that would make the radicand negative.
3. $x = 7$
4. $x = 18$
5. $x = 24$
6. $x = 27$
7. $x = 6$
8. $x = 6.4$
9. $x = -\dfrac{1000}{3}$
10. $x = \frac{2}{9}$
11. $x = 1024$
12. no real solution
13. about 21.7 yr
14. about 11.5 m
15. $x = 12$
16. $x = 25$
17. $x = 14$
18. $x = 3$
19. $x = 0$ and $x = \frac{1}{2}$
20. $x = \frac{1}{2}$
21. $x = 3$
22. $x = 7.5$
23. $x = -1$
24. $x = -\frac{43}{15}$
25. $x = 4$
26. $x = 0.25$
27. $x = \pm 8$
28. $x = 4$
29. no real solution
30. $x = 81$
31. $x = 3$
32. $x = 1$
33. $x = 5$
34. $x = 1$ and $x = 2$
35. Only one side of the equation was cubed;

$$\sqrt[3]{3x-8} = 4$$
$$\left(\sqrt[3]{3x-8}\right)^3 = 4^3$$
$$3x - 8 = 64$$
$$x = 24$$

36. When raising each side to an exponent, the 8 was not included;

$$8x^{3/2} = 1000$$
$$(8x^{3/2})^{2/3} = 1000^{2/3}$$
$$4x = 1000$$
$$x = 25$$

ANSWERS

37. $x \geq 64$
38. $x \leq 129$
39. $x > 27$
40. $0 \leq x < \frac{64}{49}$
41. $0 \leq x \leq \frac{25}{4}$
42. $x \geq 20$
43. $x > -220$
44. $x \geq 0$
45. about 0.15 in.
46. **a.** about 5.9 ft, about 2.6 ft
    b. about 23.4 ft, about 10.5 ft
    c. no; When the hang time doubles, the height increases by a factor of 4.

5.5

ANSWERS

1. You can add, subtract, multiply, or divide f and g.
2. Any x-values not in the domains of both functions and any x-values that result in the denominator being equal to 0.
3. $(f+g)(x) = 14\sqrt[4]{x}$ and the domain is $x \geq 0$; $(f-g)(x) = -24\sqrt[4]{x}$ and the domain is $x \geq 0$; $(f+g)(16) = 28$; $(f-g)(16) = -48$
4. $(f+g)(x) = -10\sqrt[3]{2x}$ and the domain is all real numbers; $(f-g)(x) = 12\sqrt[3]{2x}$ and the domain is all real numbers; $(f+g)(-4) = 20$; $(f-g)(-4) = -24$
5. $(f+g)(x) = -7x^3 + 5x^2 + x$ and the domain is all real numbers; $(f-g)(x) = -7x^3 - 13x^2 + 11x$ and the domain is all real numbers; $(f+g)(-1) = 11$; $(f-g)(-1) = -17$
6. $(f+g)(x) = -x^2 + 4x + 4$ and the domain is all real numbers; $(f-g)(x) = 5x^2 + 18x - 4$ and the domain is all real numbers; $(f+g)(2) = 8$; $(f-g)(2) = 52$
7. $(fg)(x) = 2x^{10/3}$ and the domain is all real numbers; $\left(\dfrac{f}{g}\right)(x) = 2x^{8/3}$ and the domain is $x \neq 0$; $(fg)(-27) = 118{,}098$; $\left(\dfrac{f}{g}\right)(-27) = 13{,}122$
8. $(fg)(x) = 3x^{9/2}$ and the domain is $x \geq 0$; $\left(\dfrac{f}{g}\right)(x) = \dfrac{x^{7/2}}{3}$ and the domain is $x > 0$; $(fg)(4) = 1536$; $\left(\dfrac{f}{g}\right)(4) = \dfrac{128}{3}$
9. $(fg)(x) = 36x^{3/2}$ and the domain is $x \geq 0$; $\left(\dfrac{f}{g}\right)(x) = \dfrac{4}{9}x^{1/2}$ and the domain is $x > 0$; $(fg)(9) = 972$; $\left(\dfrac{f}{g}\right)(9) = \dfrac{4}{3}$

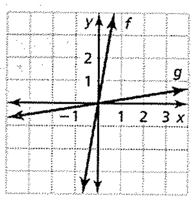
5.5

10. $(fg)(x) = 77x^{16/3}$ and the domain is all real numbers; $\left(\dfrac{f}{g}\right)(x) = \dfrac{11}{7}x^{2/3}$ and the domain is $x \neq 0$; $(fg)(-8) = 5{,}046{,}272$; $\left(\dfrac{f}{g}\right)(-8) = \dfrac{44}{7}$
11. $(fg)(x) = -98x^{11/6}$ and the domain is $x \geq 0$; $\left(\dfrac{f}{g}\right)(x) = -\dfrac{1}{2}x^{7/6}$; and the domain is $x > 0$; $(fg)(64) = -200{,}704$; $\left(\dfrac{f}{g}\right)(64) = -64$
12. $(fg)(x) = 8x^{7/4}$ and the domain is $x \geq 0$; $\left(\dfrac{f}{g}\right)(x) = 2x^{3/4}$ and the domain is $x > 0$; $(fg)(16) = 1024$; $\left(\dfrac{f}{g}\right)(16) = 16$
13. 2541.04; 2458.96; 102,598.56; 60.92
14. 245.62; −40.94; 14,663.04; 0.71
15. 7.76; −14.60; −38.24; −0.31
16. 29.01; −11.12; 179.44; 0.45
22. B; A; The y-intercept in A is less than in B.
23. $(f+g)(3) = -21$; $(f-g)(1) = -1$; $(fg)(2) = 0$; $\left(\dfrac{f}{g}\right)(0) = 2$
25. $r(x) = x^2 - \frac{1}{2}x^2 = \frac{1}{2}x^2$

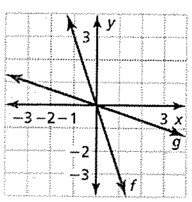
5.6 Evens are recommended.

ANSWERS

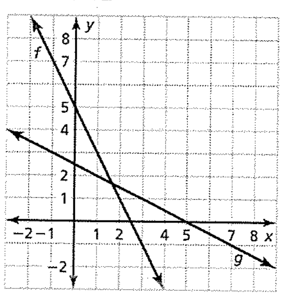
1. Inverse functions are functions that undo each other.
2. Use the horizontal line test.
3. x; x
4. Write an equation that represents a reflection of the graph of $f(x) = 5x - 2$ in the x-axis; $y = -5x + 2$; $y = \frac{x+2}{5}$
5. $x = \frac{y-5}{3}$; $-\frac{8}{3}$
6. $x = \frac{y+2}{-7}$; $\frac{1}{7}$
7. $x = 2y + 6$; 0
8. $x = -\frac{3y-3}{2}$; 6
9. $x = \sqrt[3]{\frac{y}{3}}$; -1
10. $x = \pm\sqrt[4]{\frac{y+5}{2}}$; ± 1
11. $x = 2 \pm \sqrt{y+7}$; 0, 4
12. $x = \sqrt[3]{y+1} + 5$; The input is $\sqrt[3]{-2} + 5$ when the output is -3.
13. $g(x) = \frac{1}{6}x$;



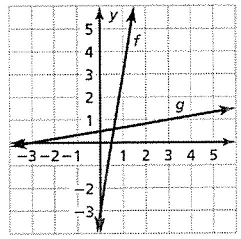
14. $g(x) = -\frac{1}{3}x$;



15. $g(x) = \frac{x-5}{-2}$;



16. $g(x) = \frac{x+3}{6}$;

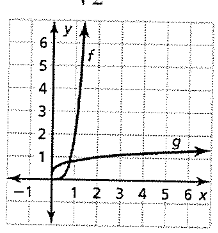


17. $y = -2x + 8$
18. $y = 3x + 3$
19. $y = \frac{3}{2}x + \frac{1}{2}$
20. $y = -\frac{5}{4}x + \frac{1}{4}$
21. $y = \frac{x-4}{-3}$

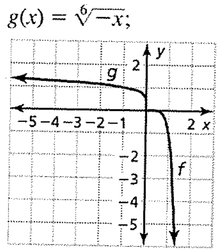
22a) Inverses
b) Not inverses
c) Not inverses.

23. $f^{-1}(x) = -\frac{\sqrt{x}}{2}$, $x \geq 0$
24. $f^{-1}(x) = -\frac{\sqrt{x}}{2}$, $x \geq 0$
25. $f^{-1}(x) = x^{\frac{1}{3}} + 3$
26. $f^{-1}(x) = x^{\frac{1}{3}} - 4$
27. $f^{-1}(x) = +\sqrt[4]{\frac{x}{2}}$, $x \geq 0$

27. $g(x) = \sqrt[4]{\frac{x}{2}}$;



28. $g(x) = \sqrt[6]{-x}$;



29. When switching x and y, the negative should not be switched with the variables;
$$y = -x + 3$$
$$x = -y + 3$$
$$-x + 3 = y$$
30. The inverse should only be $y = \sqrt{7x}$ because the domain of f is $x \geq 0$.
$$f(x) = \tfrac{1}{7}x^2, x > 0$$
$$y = \tfrac{1}{7}x^2$$
$$x = \tfrac{1}{7}y^2$$
$$7x = y^2$$
$$\sqrt{7x} = y$$
31. no; The function does not pass the horizontal line test.
32. no; The function does not pass the horizontal line test.
33. no; The function does not pass the horizontal line test.
34. yes; The function passes the horizontal line test.
35. yes; $g(x) = \sqrt[3]{x+1}$
36. yes; $g(x) = \sqrt[3]{-x+3}$
37. yes; $g(x) = x^2 - 4$, where $x \geq 0$
38. yes; $g(x) = x^2 + 6$, where $x \geq 0$
39. yes; $g(x) = \frac{x^3}{8} + 5$
40. no; $y = \pm\sqrt{\frac{x+5}{2}}$
41. no; $g(x) = \pm\sqrt[4]{x-2}$
42. yes; $g(x) = \sqrt[3]{\frac{x+5}{2}}$
43. yes; $g(x) = \frac{x^3}{27} - 1$
44. yes; $g(x) = \frac{-3x^3 - 4}{2}$
45. yes; $g(x) = \sqrt[5]{2x}$
46. yes; $g(x) = \frac{x^2 + 21}{12}$, where $x \leq 0$
47. B
48. C
49. The functions are not inverses.
50. The functions are inverses.
51. The functions are inverses.
52. The functions are not inverses.
53. $\ell = \left(\frac{v}{1.34}\right)^2$; about 31.3 ft