

Chapter 5 Review KEY

Find the indicated real nth root(s).

1. $\sqrt[3]{216}$

$\boxed{6}$

2. $\sqrt{25}$

$\boxed{\pm 5}$

3. $\sqrt[5]{-243}$

$\boxed{-3}$

4. $\sqrt[4]{16}$

$\boxed{\pm 2}$

Evaluate the expression without using technology.

5. $49^{3/2}$

$\boxed{343}$

6. $125^{-2/3}$

$\boxed{\frac{1}{25}}$

Find the real solution(s) of the equation. Round your answer to two decimal places, if necessary.

7. $\frac{3x^2}{3} = \frac{75}{3}$

$\sqrt{x^2} = \sqrt{25}$

$\boxed{x = \pm 5}$

8. $\sqrt[3]{(x+3)^3} = \sqrt[3]{64}$

$x+3 = 4$

$-3 \quad -3$

$\boxed{x = 1}$

Use the properties of rational exponents to simplify the expression.

9. $(4^3)^{2/3}$

$\boxed{(4)^2 = 16}$

10. $\frac{7^{1/3}}{7} = \frac{1}{7^{2/3}}$

11. $\left(\frac{6^3}{10^3}\right)^{-1/3}$

$\left(\left(\frac{3}{5}\right)^3\right)^{-1/3}$

$\left(\frac{3}{5}\right)^{-1}$

$\boxed{\frac{5}{3}}$

12. $(8^{-1} \cdot 8^{1/3})^{-1}$

$(8^{-2/3})^{-1}$

$8^{2/3} = \boxed{4}$

13. $\sqrt{4} \cdot \sqrt{24}$

$\frac{\sqrt{96}}{16 \cdot 6}$

$\boxed{4\sqrt{6}}$

14. $\sqrt[4]{25} \cdot \sqrt[4]{25}$

$\sqrt[4]{625} = \boxed{5}$

$$15. \frac{\sqrt[5]{64}}{\sqrt[5]{2}} = \sqrt[5]{32} = \boxed{2}$$

$$16. \frac{\sqrt{5}}{\sqrt{45}} = \frac{\sqrt{1}}{\sqrt{9}} = \boxed{\frac{1}{3}}$$

$$17. \frac{\sqrt[3]{3} \cdot \sqrt[3]{54}}{\sqrt[3]{9}} = \frac{\sqrt[3]{3 \cdot 3 \cdot 6}}{\sqrt[3]{3 \cdot 3}} = \boxed{\sqrt[3]{18}}$$

$$18. \frac{2}{6-\sqrt{5}} \cdot \frac{6+\sqrt{5}}{6+\sqrt{5}} = \frac{12+2\sqrt{5}}{36-5} = \boxed{\frac{12+2\sqrt{5}}{31}}$$

$$19. 13(4^{2/7}) + 6(4^{2/7}) = \boxed{19(4^{2/7})}$$

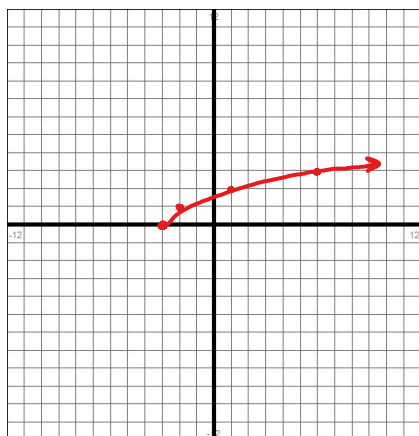
$$20. \sqrt[3]{\frac{3}{24}} = \sqrt[3]{\frac{1}{8}} = \boxed{\frac{1}{3}}$$

$$21. \sqrt[3]{\frac{16x^2y^5z^9}{8 \cdot 2}} = 2yz \sqrt[3]{2x^2y^2}$$

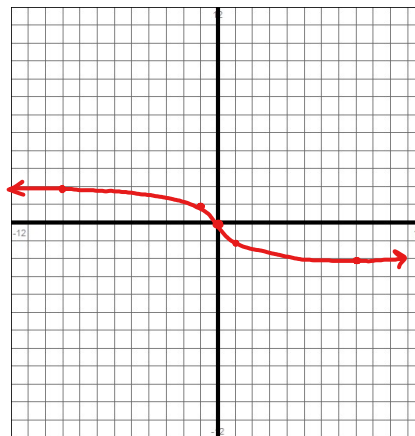
$$22. \sqrt[4]{16x^7y^3} = \boxed{2|x| \sqrt[4]{x^3y^3}}$$

Graph each function. Find the domain and range of each function.

$$23. f(x) = \sqrt{x+3}$$



$$24. g(x) = -\sqrt[3]{x}$$



Solve the equation and check your solution(s).

25. $(\sqrt{x+1})^2 = (4)^2$

$$\begin{array}{r} x+1 = 16 \\ -1 \quad -1 \\ \hline x = 15 \end{array}$$

26. $(\sqrt[3]{x-3})^3 = (-2)^3$

$$\begin{array}{r} x-3 = -8 \\ +3 \quad +3 \\ \hline x = -5 \end{array}$$

27. $3\sqrt[4]{x-1} + 5 = 14$

$$\begin{array}{r} 3\sqrt[4]{x-1} = 9 \\ -5 \quad -5 \\ \hline \frac{3\sqrt[4]{x-1}}{3} = \frac{9}{3} \\ (\sqrt[4]{x-1})^4 = (3)^4 \end{array}$$

$$\begin{array}{r} x-1 = 81 \\ +1 \quad +1 \\ \hline x = 82 \end{array}$$

28. $(\sqrt[3]{3x+12})^3 = (\sqrt[3]{32-x})^3$

$$\begin{array}{r} 3x+12 = 32-x \\ +x \quad -12 \quad -12 \quad +x \\ \hline 4x = 20 \\ \frac{4x}{4} = \frac{20}{4} \\ x = 5 \end{array}$$

29. $(x+3)^2 = (\sqrt{12x+1})^2$

$$\begin{array}{r} x^2+6x+9 = 12x+1 \\ -12x-1 \quad -12x-1 \\ \hline x^2-6x+8 = 0 \\ -2 \quad -4 \\ \hline x = 2, 4 \end{array}$$

30. $(\sqrt{3x-2})^2 = (x-2)^2$

$$\begin{array}{r} 3x-2 = x^2-4x+4 \\ -3x+2 \quad -3x+2 \\ \hline 0 = x^2-7x+6 \\ -6 \quad -1 \\ \hline x = 6, 1 \\ x = 6 \end{array}$$

31. $(\sqrt{x+5})^2 = (1-\sqrt{x-2})^2$ \emptyset

$$\begin{array}{r} x+5 = 1-2\sqrt{x-2}+x-2 \\ x+5 = -2\sqrt{x-2}+x-1 \\ -x+1 \quad -x+1 \\ \hline 6 = -2\sqrt{x-2} \\ \frac{6}{-2} = \frac{-2\sqrt{x-2}}{-2} \rightarrow (-3) = \sqrt{x-2} \\ \begin{array}{r} 9 = x-2 \\ +2 \quad +2 \\ \hline x = 7 \end{array} \end{array}$$

32. $((x+1)^{\frac{3}{2}})^{\frac{2}{3}} = (8)^{\frac{3}{2} \cdot \frac{2}{3}}$

$$\begin{array}{r} x+1 = 4 \\ -1 \quad -1 \\ \hline x = 3 \end{array}$$

33. $((x+12)^{\frac{1}{2}})^2 = x^2$

$$\begin{array}{r} x+12 = x^2 \\ -x-12 \quad -x-12 \\ \hline 0 = x^2-x-12 \\ -4 \quad 3 \\ \hline x = 4, -3 \\ x = 4 \end{array}$$

Find $(f+g)(x)$ and then evaluate $(f+g)(3)$.

34. $f(x) = \sqrt{3x}$ and $g(x) = -4\sqrt{3x}$

$$\begin{array}{l} (f+g)(x) = -3\sqrt{3x} \\ (f+g)(3) = -9 \end{array}$$

35. $f(x) = x^2 + 5x - 1$ and $g(x) = 2x^2 - x + 3$

$$\begin{array}{l} (f+g)(x) = 3x^2 + 4x + 2 \\ (f+g)(3) = 41 \end{array}$$

Find $(f-g)(x)$ and then evaluate $(f-g)(-2)$.

36. $f(x) = 3\sqrt{x}$ and $g(x) = -7\sqrt{x}$

$$\begin{array}{l} (f-g)(x) = 10\sqrt{x} \\ (f-g)(-2) = \text{No Real Value} \end{array}$$

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

$$\begin{array}{l} (f-g)(x) = -5x^2 + 8x - 3 \\ (f-g)(-2) = -39 \end{array}$$

Find $(fg)(x)$ and evaluate $(fg)(64)$.

38. $f(x) = 3x^2$ and $g(x) = x^{\frac{1}{2}}$

$$\begin{array}{l} (fg)(x) = 3x^{5/2} \\ (fg)(64) = 98,304 \end{array}$$

39. $f(x) = 2x^{\frac{2}{3}}$ and $g(x) = 5x^{\frac{1}{2}}$

$$\begin{array}{l} (fg)(x) = 10x^{7/6} \\ (fg)(64) = 1280 \end{array}$$

Find $\left(\frac{f}{g}\right)(x)$.

40. $f(x) = 5x^4$ and $g(x) = 15x^{\frac{4}{3}}$

$$\left(\frac{f}{g}\right)(x) = \frac{x^{\frac{3}{3}}}{3} \text{ or } \frac{1}{3}x^{\frac{3}{3}}$$

41. $f(x) = 12x^{\frac{3}{4}}$ and $g(x) = 3x^{\frac{2}{3}}$

$$\left(\frac{f}{g}\right)(x) = 4x^{1/12}$$

If $f(x) = 2x^2 + 6x$ and $g(x) = x - 5$, find the indicated value.

42. $f(g(7)) = \boxed{20}$

43. $g(f(-4)) = \boxed{3}$

44. $g(g(-2)) = \boxed{-12}$

45. $f(f(-3)) = \boxed{0}$

46. $f(x) = 5x + 6$, $g(x) = 3x - 2$. Find $f(g(x))$

$$f(g(x)) = 5(3x - 2) + 6$$
$$f(g(x)) = 15x - 4$$

47. $f(x) = 6x - 1$, $g(x) = -4x - 3$. Find $g(f(x))$

$$g(f(x)) = -4(6x - 1) - 1$$
$$g(f(x)) = -24x + 3$$

48. $f(x) = 2x^2$, $g(x) = x - 3$. Find $f(g(x))$

$$f(g(x)) = 2(x - 3)^2$$
$$f(g(x)) = 2(x^2 - 6x + 9)$$
$$f(g(x)) = 2x^2 - 12x + 18$$

49. $f(x) = 3x + 7$, $g(x) = 2x - 1$. Find $f(f(x))$

$$f(f(x)) = 3(3x + 7) + 7$$
$$f(f(x)) = 9x + 28$$

50. $f(x) = 3x^{-1}$, $g(x) = 6x - 2$. Find $f(g(x))$

$$f(g(x)) = 3(6x-2)^{-1}$$

$$f(g(x)) = \frac{3}{6x-2}$$

51. $f(x) = 4x - 16$, $g(x) = \sqrt{x+9}$. Find $g(f(x))$

$$g(f(x)) = \sqrt{4x-16+9}$$

$$g(f(x)) = \sqrt{4x-7}$$

Find the inverse of each function.

52. $f(x) = 2x + 8$

$$y = 2x + 8$$

$$\begin{array}{r} y \\ -8 \\ \hline \end{array} = \begin{array}{r} 2x \\ -8 \\ \hline \end{array}$$

$$\frac{y-8}{2} = \frac{2x}{2}$$

$$x = \frac{y-8}{2}$$

$$f^{-1}(x) = \frac{x-8}{2} \text{ or } f^{-1}(x) = \frac{1}{2}x - 4$$

53. $f(x) = \frac{2}{3}x + 4$

$$y = \frac{2}{3}x + 4$$

$$\begin{array}{r} y \\ -4 \\ \hline \end{array} = \begin{array}{r} \frac{2}{3}x \\ -4 \\ \hline \end{array}$$

$$\frac{3}{2}(y-4) = \frac{2}{3}x \left(\frac{3}{2}\right)$$

$$\frac{3}{2}y - 6 = x$$

$$f^{-1}(x) = \frac{3}{2}x - 6$$

54. $f(x) = \sqrt{x+3}$

$$y = \sqrt{x+3}$$

$$y^2 = (\sqrt{x+3})^2$$

$$\begin{array}{r} y^2 \\ -3 \\ \hline \end{array} = \begin{array}{r} x+3 \\ -3 \\ \hline \end{array}$$

$$x = y^2 - 3$$

$$f^{-1}(x) = x^2 - 3$$

55. $f(x) = 4x - 8$

$$y = 4x - 8$$

$$\begin{array}{r} y \\ +8 \\ \hline \end{array} = \begin{array}{r} 4x \\ -8 \\ +8 \\ \hline \end{array}$$

$$\frac{y+8}{4} = \frac{4x}{4}$$

$$x = \frac{y+8}{4}$$

$$f^{-1}(x) = \frac{x+8}{4}$$

or

$$f^{-1}(x) = \frac{1}{4}x + 2$$

Determine whether the functions are inverse functions.

56. $f(x) = \frac{x-6}{3}$, $g(x) = 3x + 6$

SAME

$$y = 3x + 6$$

$$\begin{array}{r} y \\ -6 \\ \hline \end{array} = \begin{array}{r} 3x \\ -6 \\ \hline \end{array}$$

$$\frac{y-6}{3} = \frac{3x}{3}$$

$$\frac{y-6}{3} = x$$

$$g^{-1}(x) = \frac{x-6}{3}$$

yes

57. $f(x) = \sqrt{x-4}$, $g(x) = x^2 + 4$

$$y = \sqrt{x-4}$$

$$y^2 = (\sqrt{x-4})^2$$

$$\begin{array}{r} y^2 \\ +4 \\ \hline \end{array} = \begin{array}{r} x-4 \\ +4 \\ \hline \end{array}$$

$$y^2 + 4 = x$$

$$f^{-1}(x) = x^2 + 4$$

Same

yes