

Chapter 7: Powers, Roots and Radicals

Write each expression with rational exponents.

1) $(\sqrt{7x})^5$

2) $(\sqrt[3]{4x})^4$

3) $(\sqrt[6]{2k})^7$

4) $\sqrt[5]{m}$

5) $(\sqrt[5]{v})^6$

6) $\frac{1}{(\sqrt[6]{10a})^5}$

Write each expression in radical form.

7) $(7m)^{-\frac{1}{2}}$

8) $(k^2)^{-\frac{1}{3}}$

9) $(5k)^{\frac{1}{2}}$

10) $x^{\frac{3}{2}}$

11) $(10n)^{-\frac{1}{2}}$

12) $(2v)^{\frac{3}{4}}$

Simplify. Your answer should contain only positive exponents with no fractional exponents in the denominator.

13) $\frac{\left(m^{\frac{2}{3}}n^2\right)^2}{(n^{-2})^3 \cdot \left(m^{-1}n^{\frac{4}{3}}\right)^2}$

14) $\left(\frac{x^{\frac{1}{2}}y^{\frac{1}{4}} \cdot \left(x^{\frac{7}{4}}\right)^{\frac{3}{2}}}{y^{\frac{2}{3}}}\right)^{\frac{3}{2}}$

15) $\left(\frac{x^{\frac{3}{2}}y^{\frac{3}{2}} \cdot xy}{x^2y^{-\frac{2}{3}}}\right)^{-\frac{5}{3}}$

16) $\frac{(ab)^{-\frac{1}{2}} \cdot a^{\frac{1}{2}}b^{\frac{5}{4}}}{a^{\frac{2}{3}}b^2}$

$$17) \left(\frac{m^{\frac{7}{4}} n^2}{\left(\left(nm^{-\frac{5}{4}} \right)^{-1} \cdot m^{-3} n^{\frac{3}{2}} \right)^{-\frac{1}{2}}} \right)^{\frac{5}{4}}$$

$$18) \left(\frac{ab^{\frac{3}{4}}}{ab^{\frac{2}{3}} \cdot a^2} \right)^{\frac{1}{2}}$$

Perform the indicated operation.

$$19) \begin{aligned} g(n) &= n + 1 \\ f(n) &= -3n^3 - 2n \\ \text{Find } (g - f)(n) \end{aligned}$$

$$20) \begin{aligned} g(x) &= x - 4 \\ h(x) &= x^3 + 1 \\ \text{Find } (g + h)(x) \end{aligned}$$

$$21) \begin{aligned} g(n) &= n^2 + 2 \\ h(n) &= 3n + 3 \\ \text{Find } (g - h)(n) \end{aligned}$$

$$22) \begin{aligned} g(x) &= x^2 - 3x \\ h(x) &= 3x - 1 \\ \text{Find } (g + h)(x) \end{aligned}$$

$$23) \begin{aligned} g(x) &= -3x + 4 \\ f(x) &= 3x + 2 \\ \text{Find } (g \cdot f)(x) \end{aligned}$$

$$24) \begin{aligned} f(x) &= 2x - 2 \\ g(x) &= x^3 + 2x \\ \text{Find } \left(\frac{f}{g} \right)(x) \end{aligned}$$

$$25) \begin{aligned} g(n) &= 2n + 4 \\ f(n) &= 4n \\ \text{Find } (g \cdot f)(n) \end{aligned}$$

$$26) \begin{aligned} g(n) &= 3n + 2 \\ f(n) &= 2n^2 - 1 + 2n \\ \text{Find } (g \cdot f)(n) \end{aligned}$$

$$27) \begin{aligned} f(t) &= t - 2 \\ g(t) &= 2t^2 + 5 \\ \text{Find } (f \circ g)(t) \end{aligned}$$

$$28) \begin{aligned} f(x) &= 3x - 2 \\ g(x) &= 3x \\ \text{Find } (f \circ g)(x) \end{aligned}$$

$$29) \begin{aligned} h(x) &= -x^2 + x \\ g(x) &= 4x + 5 \\ \text{Find } (h \circ g)(x) \end{aligned}$$

$$30) \begin{aligned} g(x) &= 3x + 4 \\ f(x) &= x^3 + 5x^2 \\ \text{Find } (g \circ f)(x) \end{aligned}$$

State if the given functions are inverses.

$$31) \begin{aligned} g(x) &= (x - 2)^3 \\ f(x) &= -x^3 + 2 \end{aligned}$$

$$32) \begin{aligned} g(x) &= -2x^3 + 1 \\ f(x) &= \frac{4 - \sqrt[3]{4x}}{2} \end{aligned}$$

33) $f(x) = \frac{4}{x-1} - 1$

$g(x) = \frac{4}{x+1} + 1$

34) $g(x) = \frac{3}{x+3} + 1$

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

Find the inverse of each function.

35) $f(x) = -\frac{1}{5}x + \frac{3}{5}$

36) $g(x) = -\sqrt[3]{x} + 2$

37) $g(x) = -3 - 2x^5$

38) $f(x) = (x-2)^5 + 3$

Solve each equation. Remember to check for extraneous solutions.

39) $\sqrt{-60 + 16k} = k$

40) $\sqrt{20 - v} = v$

41) $p = \sqrt{-5 + 6p}$

42) $\sqrt{3k - 17} = k - 5$

43) $-x + \sqrt{16 - 2x} = -8$

44) $\sqrt{-32 + 12p} = p$

45) $\sqrt{2n - 13} = \sqrt{n - 6}$

46) $\sqrt{42 - p} = p$

Answers to Chapter 7: Powers, Roots and Radicals (ID: 1)

1) $(7x)^{\frac{5}{2}}$

5) $v^{\frac{6}{5}}$

9) $\sqrt{5k}$

13) $n^{\frac{14}{3}} m^{\frac{10}{3}}$

17) $n^{\frac{45}{16}} m^{\frac{35}{32}}$

21) $n^2 - 3n - 1$

25) $8n^2 + 16n$

29) $-16x^2 - 36x - 20$

33) Yes

37) $g^{-1}(x) = \sqrt[5]{\frac{-x-3}{2}}$

40) $\{4\}$

44) $\{4, 8\}$

2) $(4x)^{\frac{4}{3}}$

6) $(10a)^{-\frac{5}{6}}$

10) $(\sqrt{x})^3$

14) $y^{\frac{3}{8}} x^{\frac{75}{16}}$

18) $\frac{y}{b^{\frac{1}{24}}}$

18) $\frac{b}{a}$

22) $x^2 - 1$

26) $6n^3 + 10n^2 + n - 2$

30) $3x^3 + 15x^2 + 4$

34) Yes

38) $f^{-1}(x) = \sqrt[5]{x-3} + 2$

41) $\{1, 5\}$

45) $\{7\}$

3) $(2k)^{\frac{7}{6}}$

7) $\frac{1}{\sqrt{7m}}$

11) $\frac{1}{\sqrt{10n}}$

15) $\frac{x^{\frac{1}{6}} y^{\frac{13}{18}}}{xy^6}$

19) $3n^3 + 3n + 1$

23) $-9x^2 + 6x + 8$

27) $2t^2 + 3$

31) No

35) $f^{-1}(x) = -5x + 3$

39) $\{6, 10\}$

42) $\{7, 6\}$

46) $\{6\}$

4) $m^{\frac{1}{5}}$

8) $\frac{1}{\sqrt[3]{k^2}}$

12) $(\sqrt[4]{2v})^3$

16) $\frac{b^{\frac{3}{4}} a^{\frac{1}{3}}}{b^2 a}$

20) $x^3 + x - 3$

24) $\frac{2x-2}{x^3+2x}$

28) $9x - 2$

32) No

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

43) $\{8\}$