

Chapter 7: Powers, Roots and Radicals

Write each expression with rational exponents.

1) $\sqrt[3]{6x}$

2) $(\sqrt{7x})^3$

3) $(\sqrt[3]{6n})^5$

4) $\frac{1}{(\sqrt[3]{4n})^4}$

5) $\sqrt[3]{2n}$

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

Write each expression in radical form.

7) $(10r)^{\frac{8}{5}}$

8) $(3p)^{\frac{5}{2}}$

9) $(4v)^{\frac{5}{3}}$

10) $(6x)^{\frac{5}{2}}$

11) $(3x)^{-\frac{4}{3}}$

12) $(3x^3)^{-\frac{1}{4}}$

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

13)
$$\frac{x^{\frac{2}{3}}}{\left(x^{-\frac{1}{2}}y^{-1} \cdot y^2\right)^{\frac{3}{2}}}$$

14)
$$\left(\frac{x^{-\frac{4}{3}}y^{\frac{2}{3}} \cdot \left(x^{-\frac{5}{3}}y^2\right)^{\frac{3}{2}}}{x^{\frac{5}{3}}y^{\frac{2}{3}}}\right)^2$$

15)
$$\frac{\left(a^2b^{\frac{4}{3}}\right)^{-2} \cdot ab^{\frac{1}{3}}}{a^{\frac{1}{3}}}$$

16)
$$\frac{m^2}{n^2n^{-\frac{3}{2}}}$$

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

$$18) \frac{uv^{\frac{3}{2}}}{u^{\frac{4}{3}} v^{-2} \cdot \left(u^2 v^{\frac{1}{2}}\right)^{-2}}$$

Perform the indicated operation.

$$19) \begin{aligned} g(n) &= n^2 - 4 \\ h(n) &= 4n + 5 \\ \text{Find } (g - h)(n) \end{aligned}$$

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

$$21) \begin{aligned} f(t) &= 3t + 4 \\ g(t) &= t^2 + 3t \\ \text{Find } (f + g)(t) \end{aligned}$$

$$22) \begin{aligned} f(n) &= 3n - 5 \\ g(n) &= 2n + 1 \\ \text{Find } (f + g)(n) \end{aligned}$$

$$23) \begin{aligned} g(n) &= n^2 - 1 \\ h(n) &= 4n + 4 \\ \text{Find } (g \cdot h)(n) \end{aligned}$$

$$24) \begin{aligned} h(x) &= x^3 - 4x \\ g(x) &= 4x + 4 \\ \text{Find } (h \cdot g)(x) \end{aligned}$$

$$25) \begin{aligned} g(x) &= 4x - 1 \\ h(x) &= x + 5 \\ \text{Find } \left(\frac{g}{h}\right)(x) \end{aligned}$$

$$26) \begin{aligned} h(x) &= 3x + 1 \\ g(x) &= 4x + 3 \\ \text{Find } (h \cdot g)(x) \end{aligned}$$

$$27) \begin{aligned} g(t) &= t^3 - 4t \\ f(t) &= t + 5 \\ \text{Find } (g \circ f)(t) \end{aligned}$$

$$28) \begin{aligned} g(x) &= x^2 - 3 \\ h(x) &= 4x - 1 \\ \text{Find } (g \circ h)(x) \end{aligned}$$

$$29) \begin{aligned} g(t) &= 3t - 4 \\ h(t) &= t^3 + 3t \\ \text{Find } (g \circ h)(t) \end{aligned}$$

$$30) \begin{aligned} h(a) &= a - 4 \\ g(a) &= a^2 + 4 \\ \text{Find } (h \circ g)(a) \end{aligned}$$

State if the given functions are inverses.

$$31) \begin{aligned} f(x) &= \sqrt[3]{\frac{-x + 2}{2}} \\ h(x) &= -2x^3 + 2 \end{aligned}$$

$$32) \begin{aligned} h(x) &= \sqrt[5]{\frac{-x - 2}{2}} \\ f(x) &= -2 - 2x^5 \end{aligned}$$

$$33) \quad g(x) = -\frac{2}{-x+3}$$
$$f(x) = \frac{2}{x} + 3$$

$$34) \quad f(x) = \frac{4}{x-3} + 1$$
$$g(x) = \frac{4}{x-1} + 3$$

Find the inverse of each function.

$$35) \quad g(x) = -\frac{1}{x+2} - 3$$

$$36) \quad g(x) = -\frac{1}{x+2} + 2$$

$$37) \quad f(x) = \sqrt[3]{x+2} + 1$$

$$38) \quad f(x) = \sqrt[5]{x-2} - 2$$

Solve each equation. Remember to check for extraneous solutions.

$$39) \quad \sqrt{110-x} = x$$

$$40) \quad k-5 = \sqrt{2k-7}$$

$$41) \quad \sqrt{12-v} = v$$

$$42) \quad \sqrt{28-3r} = r$$

$$43) \quad \sqrt{p-2} = \sqrt{4-p}$$

$$44) \quad \sqrt{\frac{x}{10}} = \sqrt{88-x}$$

$$45) \quad \sqrt{2x+9} = \sqrt{-1-8x}$$

$$46) \quad \sqrt{3r-2} = \sqrt{18-2r}$$

Answers to Chapter 7: Powers, Roots and Radicals (ID: 2)

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

2) $(7x)^{\frac{3}{2}}$

3) $(6n)^{\frac{5}{3}}$

4) $(4n)^{-\frac{4}{3}}$

5) $(2n)^{\frac{1}{3}}$

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

7) $(\sqrt[5]{10r})^8$

8) $(\sqrt{3p})^5$

9) $(\sqrt[3]{4v})^5$

10) $(\sqrt{6x})^5$

11) $\frac{1}{(\sqrt[3]{3x})^4}$

12) $\frac{1}{\sqrt[4]{3x^3}}$

13) $\frac{x^{\frac{17}{12}}y^{\frac{1}{2}}}{y^2}$

14) $\frac{y^6}{x^{11}}$

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

16) $\frac{m^2n^{\frac{1}{2}}}{n}$

17) $\frac{n^{\frac{1}{8}}m^{\frac{5}{12}}}{nm}$

18) $u^{\frac{11}{3}}v^{\frac{9}{2}}$

19) $n^2 - 4n - 9$

20) $x^3 + x + 1$

21) $t^2 + 6t + 4$

22) $5n - 4$

23) $4n^3 + 4n^2 - 4n - 4$

24) $4x^4 + 4x^3 - 16x^2 - 16x$

25) $\frac{4x - 1}{x + 5}$

26) $12x^2 + 13x + 3$

27) $t^3 + 15t^2 + 71t + 105$

28) $16x^2 - 8x - 2$

29) $3t^3 + 9t - 4$

30) a^2

31) Yes

32) Yes

33) Yes

34) Yes

35) $g^{-1}(x) = \frac{1}{-x - 3} - 2$

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

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

38) $f^{-1}(x) = (x + 2)^5 + 2$

39) $\{10\}$

40) $\{8\}$

41) $\{3\}$

42) $\{4\}$

43) $\{3\}$

44) $\{80\}$

45) $\{-1\}$

46) $\{4\}$