

# Section 8.3

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$$120-a) \sqrt[2]{n} = \underline{\underline{\sqrt{n}}}$$

$$120-b) \sqrt[3]{a} = \underline{\underline{\sqrt[3]{a}}}$$

$$120-c) \sqrt[4]{x} = \underline{\underline{\sqrt[4]{x}}}$$

$$122-a) \sqrt[7]{g} = \underline{\underline{\sqrt[7]{g}}}$$

$$122-b) \sqrt[5]{h} = \underline{\underline{\sqrt[5]{h}}}$$

$$122-c) \sqrt[25]{j} = \underline{\underline{\sqrt[25]{j}}}$$

$$124-a) \sqrt[8]{n} = \underline{\underline{n^{\frac{1}{8}}}}$$

$$124-b) \sqrt[10]{a} = \underline{\underline{a^{\frac{1}{10}}}}$$

$$124-c) \sqrt[4]{x} = \underline{\underline{x^{\frac{1}{4}}}}$$

$$126-a) \sqrt[4]{5x} = \underline{\underline{(5x)^{\frac{1}{4}}}}$$

$$126-b) \sqrt[8]{9y} = \underline{\underline{(9y)^{\frac{1}{8}}}}$$

$$126-c) 7\sqrt[5]{3z} = \underline{\underline{7(3z)^{\frac{1}{5}}}}$$

$$128-a) \sqrt[3]{25a} = \underline{\underline{(25a)^{\frac{1}{3}}}}$$

$$128-b) \sqrt{3b} = \underline{\underline{(3b)^{\frac{1}{2}}}}$$

$$128-c) \sqrt[8]{40c} = \underline{\underline{(40c)^{\frac{1}{8}}}}$$

$$130-a) 625^{\frac{1}{4}} = \sqrt[4]{625} = \sqrt[4]{(5)^4} = \underline{\underline{5}}$$

$$130-b) 243^{\frac{1}{5}} = \sqrt[5]{243} = \sqrt[5]{(3)^5} = \underline{\underline{3}}$$

$$130-c) 32^{\frac{1}{5}} = \sqrt[5]{32} = \sqrt[5]{(2)^5} = \underline{\underline{2}}$$

$$132-a) 64^{\frac{1}{3}} = \sqrt[3]{64} = \sqrt[3]{(2)^6} = (2)^2 = \underline{\underline{4}}$$

$$132-b) 32^{\frac{1}{5}} = \sqrt[5]{32} = \sqrt[5]{(2)^5} = \underline{\underline{2}}$$

$$132-c) 81^{\frac{1}{4}} = \sqrt[4]{81} = \sqrt[4]{(3)^4} = \underline{\underline{3}}$$

$$134-a) (-1000)^{\frac{1}{3}} = \sqrt[3]{-1000} = \sqrt[3]{(-10)^3} = \underline{\underline{-10}}$$

$$134-b) -1000^{\frac{1}{3}} = -(\sqrt[3]{1000}) = -(\sqrt[3]{(10)^3}) = -(10) = \underline{\underline{-10}}$$

$$134-c) (1000)^{-\frac{1}{3}} = \frac{1}{1000^{\frac{1}{3}}} = \frac{1}{\sqrt[3]{1000}} = \frac{1}{\sqrt[3]{(10)^3}} = \underline{\underline{\frac{1}{10}}}$$

$$136-a) (-49)^{\frac{1}{2}} = \sqrt{-49} \quad \begin{array}{l} \text{even root} \\ \text{not a real number} \end{array}$$

$$136-b) -49^{\frac{1}{2}} = -(\sqrt{49}) = -(7) = \underline{\underline{-7}}$$

$$136-c) (49)^{-\frac{1}{2}} = \frac{1}{49^{\frac{1}{2}}} = \frac{1}{\sqrt{49}} = \underline{\underline{\frac{1}{7}}}$$

$$138-a) (-16)^{\frac{1}{4}} = \sqrt[4]{-16} \quad \begin{array}{l} \text{even root} \\ \text{not a real number} \end{array}$$

$$138-b) -16^{\frac{1}{4}} = -(\sqrt[4]{16}) = -(\sqrt[4]{(2)^4}) = -(2) = \underline{\underline{-2}}$$

$$138-c) 16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{\sqrt[4]{16}} = \frac{1}{\sqrt[4]{(2)^4}} = \underline{\underline{\frac{1}{2}}}$$

$$140-a) (-32)^{\frac{1}{5}} = \sqrt[5]{-32} = \sqrt[5]{(-2)^5} = \underline{\underline{-2}}$$

$$140-b) (-243)^{-\frac{1}{5}} = \frac{1}{(-243)^{\frac{1}{5}}} = \frac{1}{\sqrt[5]{-243}} = \frac{1}{\sqrt[5]{(-3)^5}} = \frac{1}{-3} = \underline{\underline{-\frac{1}{3}}}$$

$$140-c) -125^{\frac{1}{3}} = -(\sqrt[3]{125}) = -(\sqrt[3]{(5)^3}) = -(5) = \underline{\underline{-5}}$$

$$142-a) \sqrt[4]{n^7} = \underline{\underline{n^{\frac{7}{4}}}}$$

$$142-b) (\sqrt[5]{2pq})^3 = \underline{\underline{(2pq)^{\frac{3}{5}}}}$$

$$142-c) \sqrt[4]{\left(\frac{12m}{7n}\right)^3} = \underline{\underline{\left(\frac{12m}{7n}\right)^{\frac{3}{4}}}}$$

$$144-a) \sqrt[3]{a} = \underline{\underline{a^{\frac{1}{3}}}}$$

$$144-b) (\sqrt[4]{21v})^3 = \underline{\underline{(21v)^{\frac{3}{4}}}}$$

$$144-c) \sqrt[4]{\left(\frac{2xy}{5z}\right)^2} = \underline{\underline{\left(\frac{2xy}{5z}\right)^{\frac{2}{4}}}}$$

$$146-a) 25^{\frac{3}{2}} = (\sqrt{25})^3 = (5)^3 = \underline{\underline{125}}$$

$$146-b) 9^{-\frac{3}{2}} = \frac{1}{9^{\frac{3}{2}}} = \frac{1}{(\sqrt{9})^3} = \frac{1}{(3)^3} = \underline{\underline{\frac{1}{27}}}$$

$$146-c) (-64)^{\frac{2}{3}} = (\sqrt[3]{-64})^2 = (\sqrt[3]{(-4)^3})^2 = (-4)^2 = \underline{\underline{16}}$$

$$148-a) 100^{\frac{3}{2}} = (\sqrt{100})^3 = (10)^3 = \underline{\underline{1000}}$$

$$148-b) 49^{-\frac{5}{2}} = \frac{1}{49^{\frac{5}{2}}} = \frac{1}{(\sqrt{49})^5} = \frac{1}{(7)^5} = \underline{\underline{\frac{1}{16807}}}$$

$$148-c) (-100)^{\frac{3}{2}} = (\sqrt{-100})^3 \text{ not a real number}$$

$$150-a) -64^{\frac{3}{2}} = -(\sqrt{64})^3 = -(8)^3 = -(512) = \underline{\underline{-512}}$$

$$150-b) -64^{-\frac{3}{2}} = \frac{-1}{64^{\frac{3}{2}}} = \frac{-1}{(\sqrt{64})^3} = \frac{-1}{(8)^3} = \underline{\underline{\frac{-1}{512}}}$$

$$150-c) (-64)^{\frac{3}{2}} = (\sqrt{-64})^3 \text{ not a real number}$$

$$152-a) 6^{\frac{5}{2}} \cdot 6^{\frac{1}{2}} = 6^{(\frac{5}{2} + \frac{1}{2})} = 6^{(\frac{6}{2})} = 6^3 = \underline{\underline{216}}$$

$$152-b) (b^{15})^{\frac{3}{5}} = b^{(\frac{15}{1})(\frac{3}{5})} = b^{(\frac{\cancel{15}^3(\cancel{3})}{(1)(\cancel{5}_1)})} = \underline{\underline{b^9}}$$

$$152-c) \frac{w^{\frac{2}{7}}}{w^{\frac{9}{7}}} = w^{(\frac{2}{7} - \frac{9}{7})} = w^{-\frac{7}{7}} = w^{-1} = \underline{\underline{\frac{1}{w}}}$$

$$154-a) q^{\frac{2}{3}} \cdot q^{\frac{5}{6}} = q^{(\frac{2}{3} + \frac{5}{6})} = q^{(\frac{4}{6} + \frac{5}{6})} = q^{\frac{9}{6}} = q^{\frac{3}{2}}$$

$$154-b) (h^6)^{\frac{4}{3}} = h^{(\frac{6}{1})(\frac{4}{3})} = h^{(\frac{\cancel{6}^2(\cancel{4})}{(1)(\cancel{3}_1)})} = \underline{\underline{h^8}}$$

$$154-c) \frac{n^{\frac{3}{5}}}{n^{\frac{8}{5}}} = n^{(\frac{3}{5} - \frac{8}{5})} = n^{-\frac{5}{5}} = n^{-1} = \underline{\underline{\frac{1}{n}}}$$

$$156-a) (64 \cdot \frac{3}{7})^{\frac{1}{6}} = (64)^{\frac{1}{6}} (\frac{3}{7})^{\frac{1}{6}} = (\sqrt[6]{64}) \cdot (\frac{3}{7})^{\frac{1}{6}}$$

$$= (\sqrt[6]{(2)^6}) \cdot (\frac{\cancel{6}^1(\cancel{1})}{(\cancel{7})\cancel{6}_2}) = (2)^2 \cdot \frac{1}{14} = \underline{\underline{4 \cdot \frac{1}{14}}}$$

$$156-b) (m^{\frac{1}{4}} n^{\frac{1}{2}})^{\frac{3}{4}} = (m^{\frac{1}{4}})^{\frac{3}{4}} (n^{\frac{1}{2}})^{\frac{3}{4}} = m^{(\frac{1}{4})(\frac{3}{4})} n^{(\frac{1}{2})(\frac{3}{4})}$$

$$= \underline{\underline{m^{\frac{3}{16}} n^{\frac{3}{8}}}}$$

$$158-a) (625 n^{\frac{8}{3}})^{\frac{3}{4}} = (625)^{\frac{3}{4}} (n^{\frac{8}{3}})^{\frac{3}{4}} = (\sqrt[4]{625})^3 n^{(\frac{8}{3})(\frac{3}{4})}$$

$$= (\sqrt[4]{(5)^4})^3 n^{(\frac{\cancel{8}^2(\cancel{3})}{\cancel{4}_1(\cancel{3})})} = (5)^3 n^2 = \underline{\underline{125n^2}}$$

$$158-b) \left( 9x^{\frac{2}{5}} y^{\frac{3}{5}} \right)^{\frac{5}{2}} = \left( 9 \right)^{\frac{5}{2}} \left( x^{\frac{2}{5}} \right)^{\frac{5}{2}} \left( y^{\frac{3}{5}} \right)^{\frac{5}{2}} = (\sqrt{9})^5 \left( x^{\left(\frac{2}{5}\right)\left(\frac{5}{2}\right)} \right) \left( y^{\left(\frac{3}{5}\right)\left(\frac{5}{2}\right)} \right) \\ = (3)^5 x^{\frac{(2)(5)}{(5)(2)}} y^{\frac{(3)(5)}{(5)(2)}} = \underline{\underline{243xy^{\frac{3}{2}}}}$$

$$160-a) \frac{a^{\frac{3}{4}} \cdot a^{-\frac{1}{4}}}{a^{-\frac{10}{4}}} = a^{\left(\frac{3}{4} + \left(-\frac{1}{4}\right) - \left(-\frac{10}{4}\right)\right)} = a^{\left(\frac{3}{4} - \frac{1}{4} + \frac{10}{4}\right)} \\ = a^{\frac{12}{4}} = \underline{\underline{a^3}}$$

$$160-b) \left( \frac{27b^{\frac{2}{3}}c^{-\frac{5}{2}}}{b^{-\frac{7}{3}}c^{\frac{1}{2}}} \right)^{\frac{1}{3}} = \left( \frac{27(b^{\frac{2}{3}})(b^{\frac{7}{3}})}{(c^{\frac{1}{2}})(c^{\frac{5}{2}})} \right)^{\frac{1}{3}} = \left( \frac{27b^{\left(\frac{2}{3} + \frac{7}{3}\right)}}{c^{\left(\frac{1}{2} + \frac{5}{2}\right)}} \right)^{\frac{1}{3}} \\ = \left( \frac{27b^{\frac{9}{3}}}{c^{\frac{6}{2}}} \right)^{\frac{1}{3}} = \left( \frac{27b^3}{c^3} \right)^{\frac{1}{3}} = \frac{(27b^3)^{\frac{1}{3}}}{(c^3)^{\frac{1}{3}}} \\ = \frac{(27)^{\frac{1}{3}}(b^3)^{\frac{1}{3}}}{(c^3)^{\frac{1}{3}}} = \frac{(\sqrt[3]{27})b^{\left(\frac{3}{1}\right)\left(\frac{1}{3}\right)}}{c^{\left(\frac{3}{1}\right)\left(\frac{1}{3}\right)}} = \underline{\underline{\frac{3b}{c}}}$$

$$162-a) \frac{m^{\frac{7}{4}} \cdot m^{-\frac{5}{4}}}{m^{-\frac{2}{4}}} = m^{\left(\frac{7}{4} + \left(-\frac{5}{4}\right) - \left(-\frac{2}{4}\right)\right)} = m^{\left(\frac{7}{4} - \frac{5}{4} + \frac{2}{4}\right)} = m^{\frac{4}{4}} = m' = \underline{\underline{m}}$$

$$162-b) \left( \frac{16m^{\frac{1}{5}}n^{\frac{3}{2}}}{81m^{\frac{9}{5}}n^{-\frac{1}{2}}} \right)^{\frac{1}{4}} = \left( \frac{16m^{\left(\frac{1}{5} - \frac{9}{5}\right)}n^{\left(\frac{3}{2} - \left(-\frac{1}{2}\right)\right)}}{81} \right)^{\frac{1}{4}} = \left( \frac{16m^{-\frac{8}{5}}n^{\frac{4}{2}}}{81} \right)^{\frac{1}{4}} \\ = \left( \frac{16n^2}{81m^{\frac{8}{5}}} \right)^{\frac{1}{4}} = \frac{(16n^2)^{\frac{1}{4}}}{(81m^{\frac{8}{5}})^{\frac{1}{4}}} = \frac{(16)^{\frac{1}{4}}(n^2)^{\frac{1}{4}}}{(81)^{\frac{1}{4}}(m^{\frac{8}{5}})^{\frac{1}{4}}} = \frac{(\sqrt[4]{16})n^{\left(\frac{2}{1}\right)\left(\frac{1}{4}\right)}}{(\sqrt[4]{81})m^{\left(\frac{8}{5}\right)\left(\frac{1}{4}\right)}} \\ = \underline{\underline{\frac{2n^{\frac{1}{2}}}{3m^{\frac{2}{5}}}}}$$