

Exponent

Simplify.

$$1. \left(\frac{16x^4y^{\frac{2}{3}}}{36x^2y^2} \right)^{\frac{3}{2}} =$$

$$\begin{aligned} \left(\frac{16x^4y^{\frac{2}{3}}}{36x^2y^2} \right)^{\frac{3}{2}} &= \frac{16^{\frac{3}{2}} \cdot x^{4 \cdot \frac{3}{2}} \cdot y^{\frac{2}{3} \cdot \frac{3}{2}}}{36^{\frac{3}{2}} \cdot x^{2 \cdot \frac{3}{2}} \cdot y^{2 \cdot \frac{3}{2}}} = \frac{64 \cdot x^6 \cdot y^{\frac{2}{3} \cdot \frac{3}{2}}}{216 \cdot x^3 \cdot y^{\frac{18}{2}}} = \frac{64 \cdot x^6 \cdot y}{216 \cdot x^3 \cdot y^9} = \\ &= \frac{64 \cdot x^3}{216 \cdot y^8} = \frac{8x^3}{27y^8} \end{aligned}$$

$$2. \left(\frac{9x^6y^{16}}{36x^2y^8} \right)^{\frac{1}{2}} =$$

$$\left(\frac{9x^6y^{16}}{36x^2y^8} \right)^{\frac{1}{2}} = \frac{9^{\frac{1}{2}} \cdot x^{6 \cdot \frac{1}{2}} \cdot y^{16 \cdot \frac{1}{2}}}{36^{\frac{1}{2}} \cdot x^{2 \cdot \frac{1}{2}} \cdot y^{8 \cdot \frac{1}{2}}} = \frac{3 \cdot x^3 \cdot y^8}{6 \cdot x^1 \cdot y^4} = \frac{1 \cdot x^{3-1} \cdot y^{8-4}}{3} = \frac{x^2y^4}{3}$$

$$3. \left(\frac{1x^2y^{12}}{4x^8y^6} \right)^{\frac{1}{2}} =$$

$$\begin{aligned} \left(\frac{1x^2y^{12}}{4x^8y^6} \right)^{\frac{1}{2}} &= \frac{1^{\frac{1}{2}} \cdot x^{2 \cdot \frac{1}{2}} \cdot y^{12 \cdot \frac{1}{2}}}{4^{\frac{1}{2}} \cdot x^{8 \cdot \frac{1}{2}} \cdot y^{6 \cdot \frac{1}{2}}} = \frac{1 \cdot x^1 \cdot y^6}{2 \cdot x^4 \cdot y^3} = \frac{1 \cdot x^{1-4} \cdot y^{6-3}}{2} = \frac{1 \cdot x^{-3} \cdot y^3}{2} = \\ &= \frac{1y^3}{2x^3} \text{ or } \frac{y^3}{2x^3} \end{aligned}$$

$$4. \left(\frac{27x^3y^{12}}{8x^6y^9} \right)^{\frac{1}{3}} =$$

$$\begin{aligned} \left(\frac{27x^3y^{12}}{8x^6y^9} \right)^{\frac{1}{3}} &= \frac{27^{\frac{1}{3}} \cdot x^{3 \cdot \frac{1}{3}} \cdot y^{12 \cdot \frac{1}{3}}}{8^{\frac{1}{3}} \cdot x^{6 \cdot \frac{1}{3}} \cdot y^{9 \cdot \frac{1}{3}}} = \frac{3 \cdot x^1 \cdot y^4}{2 \cdot x^2 \cdot y^3} = \frac{3 \cdot x^{1-2} \cdot y^{4-3}}{2} = \frac{3 \cdot x^{-1} \cdot y^1}{2} = \\ &= \frac{3y^1}{2x^1} = \frac{3y}{2x} \end{aligned}$$

$$5. \left(\frac{64x^{15}y^6}{8x^9y^3} \right)^{\frac{1}{3}} =$$

$$\begin{aligned} \left(\frac{64x^{15}y^6}{8x^9y^3} \right)^{\frac{1}{3}} &= \frac{64^{\frac{1}{3}} \cdot x^{15 \cdot \frac{1}{3}} \cdot y^{6 \cdot \frac{1}{3}}}{8^{\frac{1}{3}} \cdot x^{9 \cdot \frac{1}{3}} \cdot y^{3 \cdot \frac{1}{3}}} = \frac{4 \cdot x^5 \cdot y^2}{2 \cdot x^3 \cdot y^1} = \frac{2 \cdot x^{5-3} \cdot y^{2-1}}{1} = 2 \cdot x^2 \cdot y^1 = \\ &= 2x^2y^1 \end{aligned}$$

$$6. x^{\frac{2}{9}} \left(x^{-\frac{2}{9}} + x^{\frac{7}{9}} \right) =$$

$$x^{\frac{2}{9}} \left(x^{-\frac{2}{9}} + x^{\frac{7}{9}} \right) = x^{\frac{2}{9}} \cdot x^{-\frac{2}{9}} + x^{\frac{2}{9}} \cdot x^{\frac{7}{9}} = x^{\frac{2}{9}-\frac{2}{9}} + x^{\frac{2}{9}+\frac{7}{9}} = x^0 + x^{\frac{9}{9}} = 1 + x^1 = 1 + x$$

$$7. x^{\frac{2}{3}} \left(x^{\frac{4}{3}} + x^{-\frac{2}{3}} \right) =$$

$$x^{\frac{2}{3}} \left(x^{\frac{4}{3}} + x^{-\frac{2}{3}} \right) = x^{\frac{2}{3}} \cdot x^{\frac{4}{3}} + x^{\frac{2}{3}} \cdot x^{-\frac{2}{3}} = x^{\frac{2}{3} + \frac{4}{3}} + x^{\frac{2}{3} - \frac{2}{3}} = x^{\frac{6}{3}} + x^0 = x^3 + 1 = x^3 + 1$$

$$8. x^{\frac{1}{2}} \left(x^{\frac{4}{3}} + x^{\frac{5}{3}} \right) =$$

$$x^{\frac{1}{2}} \left(x^{\frac{4}{3}} + x^{\frac{5}{3}} \right) = x^{\frac{1}{2}} \cdot x^{\frac{4}{3}} + x^{\frac{1}{2}} \cdot x^{\frac{5}{3}} = x^{\frac{1}{2} + \frac{4}{3}} + x^{\frac{1}{2} + \frac{5}{3}} = x^{\frac{3}{6} + \frac{8}{6}} + x^{\frac{3}{6} + \frac{10}{6}} = x^{\frac{11}{6}} + x^{\frac{13}{6}}$$

$$9. x^{\frac{1}{3}} \left(x^{\frac{2}{3}} + x^{\frac{7}{9}} \right) =$$

$$x^{\frac{1}{3}} \left(x^{\frac{2}{3}} + x^{\frac{7}{9}} \right) = x^{\frac{1}{3}} \cdot x^{\frac{2}{3}} + x^{\frac{1}{3}} \cdot x^{\frac{7}{9}} = x^{\frac{1}{3} + \frac{2}{3}} + x^{\frac{1}{3} + \frac{7}{9}} = x^{\frac{3}{3}} + x^{\frac{3}{9} + \frac{7}{9}} = x + x^{\frac{10}{9}}$$

$$10. x^{\frac{5}{8}} \left(x^{\frac{3}{8}} + x^{\frac{7}{8}} \right) =$$

$$x^{\frac{5}{8}} \left(x^{\frac{3}{8}} + x^{\frac{7}{8}} \right) = x^{\frac{5}{8}} \cdot \left(x^{\frac{5}{8}} \cdot x^{\frac{3}{8}} + x^{\frac{5}{8}} \cdot x^{\frac{7}{8}} \right) = x^{\frac{3}{8} + \frac{5}{8}} + x^{\frac{7}{8} + \frac{5}{8}} = x^{\frac{8}{8}} + x^{\frac{12}{8}} = x + x^{\frac{3}{2}}$$