

Rules of Exponents

$$x^3 \cdot x^2 = x^5$$

$$(x^3)^2 = x^6$$

$$\frac{x^7}{x^4} = x^3$$

$$\frac{y^2 x^{-3} z^5}{y^{-4} x^6 z^7} = \frac{y^2 \boxed{x^{-3}} z^5}{\boxed{y^{-4}} x^6 z^7} = \frac{y^4 y^2 z^5}{x^3 x^6 z^7} = \frac{y^6}{x^9 z^2}$$

$$\sqrt[5]{x^2} = x^{\frac{2}{5}}$$

1. Simplify

a. $(5x^2)(14x^3)$

b. $\frac{12x^4 y^9}{3x^5 y^7}$

c. $(3x^3 y^2)^2$

d. $(5x^3 y^2)(-6x^6 y^4)$

e. $(-3m^3 n^4)^2 (4m^4 n^7)$

f. $\frac{24a^{-3} b^7 c^2}{16a^2 b^4 c^7}$

(1 continued) Simplify

g. $\left(\frac{3a^6b^3c^2}{2a^2b^4}\right)^2$

h. $(3x^2y^4z)(4x^3y^{-2}z^8)$

i. $(5a^3b^{-2}c^5)^2$

j. $\left(\frac{4x^2y^{-3}}{y^{-2}}\right)^{-1}$

k. $(8x^7y^3)(3x^{-4}y^8)^2$

l. $(9a^3b^5)(-4a^3b^7)^2$

m. $\left(\frac{4m^4n^{-3}p^2}{6m^2n^2}\right)^{-2}$

n. $\left(\frac{3x}{y^{-3}}\right)^3\left(\frac{5x^{-10}yz^2}{2x^{-1}y^3}\right)^{-2}$

Rules of Logarithms

a. $\log_2 8 + \log_2 4$

b. $\log_3 81 - \log_3 3$

c. $\log_2(8^3)$

d. $\log_c a + \log_c b$

e. $\log_d x - \log_d y$

f. $b \cdot \log_t(a)$

2. Rewrite the following as a single logarithm expression and simplify.

a. $\log_2(40) - \log_2(10)$

b. $\log_5(30) + \log_5(2) - \log_5(4)$

c. $\ln(8x) - 2 \cdot \ln(x)$

d. $\log_3(4x) + \log_3(2y^2) - \log_3(z)$

e. $2 \cdot \log_b(3x) + 3 \cdot \log_b(2x) - \log_b(x^2)$

f. $2 \cdot \ln(2x) + 3 \cdot \ln(x^3) - \ln(6)$

3. Expand each of the single logarithm expressions in to multiple logarithms.

a. $\log_5(12x^3)$

b. $\ln\left(\frac{4x^3}{3y^2}\right)$

c. $\log_2\left(\frac{8a^3b}{c}\right)$

d. $\ln\left(\frac{3a^x}{b^2}\right)$