

Integer exponents

$a \in \mathbb{R}$ $n \in \mathbb{N}$ $a \neq 0$	$\underbrace{a \cdot a \cdot \dots \cdot a}_{n \text{ times}} = a^n$ $a^0 = 1$	$a^{-n} = \frac{1}{a^n}$ $a^m \cdot a^n = a^{n+m}$ $\frac{a^m}{a^n} = a^{m-n}$	$(a^m)^n = a^{m \cdot n}$ $(a \cdot b)^n = a^n \cdot b^n$ $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
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① Write in form of a power.

$$\bullet (3a^3)^{-4} = 3^{-4} (a^3)^{-4} = \frac{1}{3^4} \cdot a^{3 \cdot (-4)} = \frac{1}{3^4} \cdot a^{-12}$$

$$\bullet (-5a^{-1})^{-4} = (-5)^{-4} (a^{-1})^{-4} = \frac{1}{(-5)^4} \cdot a^{(-1) \cdot (-4)} = \frac{1}{(-1)^4 5^4} a^4 = \frac{1}{5^4} a^4$$

$$\begin{aligned} \bullet \frac{\left(\frac{1}{3} a^{-2}\right)^{-1}}{a^5} &= \left(\frac{1}{3} a^{-2}\right)^{-1} \cdot \frac{1}{a^5} = \left(\frac{1}{3}\right)^{-1} (a^{-2})^{-1} \cdot a^{-5} \\ &= \frac{1}{\frac{1}{3}} \cdot a^{(-2) \cdot (-1)} \cdot a^{(-5)} \\ &= \frac{1}{1} \cdot \frac{3}{1} \cdot a^{2+(-5)} = 3a^{-3} \end{aligned}$$

② Simplify

$$\begin{aligned} &(-20x^5y^8) \cdot \left(\frac{1}{5}x^7y^7\right) \\ &= (-20)\left(\frac{1}{5}\right) (x^5 \cdot x^7) (y^8 \cdot y^7) \\ &= -4 x^{5+7} \cdot y^{8+7} \\ &= -4 x^{12} y^{15} \end{aligned}$$

③ Eliminate a negative power.

$$\begin{aligned} \bullet (3y^{-2})(-4y^{-5}) &= 3(-4) y^{-2} \cdot y^{-5} \\ &= -12 y^{-2+(-5)} = -12 y^{-7} = \frac{-12}{y^7} \end{aligned}$$

$$\begin{aligned} \bullet \left(\frac{y^6x^{-10}}{y^7x^{-9}}\right) \left(\frac{x^{-11}}{y^{-5}}\right)^3 &= \left(\frac{y^6x^{-10}}{y^7x^{-9}}\right) \cdot \left(\frac{x^{3(-11)}}{y^{3(-5)}}\right) \\ &= \frac{y^6x^{-10}}{y^7x^{-9}} \cdot \frac{x^{-33}}{y^{-15}} = \frac{y^6}{y^7} y^{-15} \cdot \frac{x^{-10} \cdot x^{-33}}{x^{-9}} = y^6 \cdot \left(\frac{1}{y^7}\right) \cdot \left(\frac{1}{y^{15}}\right) \cdot \left(\frac{1}{x^9}\right)^{43} \\ &= y^6 \cdot y^{-7} \cdot y^{-15} \cdot x^{-9} \cdot x^{-43} = y^{14} \cdot x^{-9-43} = \frac{y^{14}}{x^{52}} \end{aligned}$$