

September 2nd, 2008

1.1 Laws of Exponents

Base $\rightarrow 7^3 \leftarrow$ Exponent } Power

① PRODUCT LAW

$$x^n \cdot x^m = x^{n+m}$$

$$\text{eg. } 3^5 \cdot 3^{-7} = 3^{-2}$$

② QUOTIENT LAW

$$\frac{x^n}{x^m} = x^{n-m}$$

$$\text{eg. } \frac{3^5}{3^{-7}} = 3^{12}$$

③ POWER OF A POWER

$$(x^n)^m = x^{nm}$$

$$\text{eg. } (3^5)^{-7} = 3^{-35}$$

④ $x^0 = 1$

⑤ $(xy)^n = x^n y^n$

$$\textcircled{6} \quad \left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$\textcircled{7} \quad x^{-n} = \frac{1}{x^n}$$
$$\left(\frac{1}{x}\right)^n$$
$$= \frac{1^n}{x^n}$$

* Only Change
Exponent sign

* Base gets flipped

$$\text{eg. } (-3)^{-2}$$
$$= \frac{1}{(-3)^2}$$

$$\text{eg. } -3^2 = -9$$
$$(-3)^2 = +9$$

$$\textcircled{8} \quad \left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$$

Evaluate

$$1) (-1)^{745} \leftarrow \begin{array}{l} \text{odd will give negative} \\ \text{even will give positive} \end{array}$$
$$= -1$$

$$2) (-5)^6 \div (-5)^4$$
$$= (-5)^2$$
$$= 25$$

Simplify

$$\begin{aligned} 1) & \left((3^2)^{-3} \right)^4 \\ & = 3^{-24} \\ & = \frac{1}{3^{24}} \end{aligned}$$

$$\begin{aligned} 2) & \left(\frac{x}{3y^2} \right)^4 \\ & = \frac{x^4}{3^4(y^2)^4} \end{aligned}$$

$$\begin{aligned} 3) & \frac{(2x^2y^5)^2}{(x^4y^2)^3} \\ & = \frac{4x^4y^{10}}{x^{12}y^6} \\ & = 4x^{-8}y^4 \\ & = \frac{4y^4}{x^8} \end{aligned}$$

$$= \frac{x^4}{81y^8}$$

Evaluate

$$\frac{4^{-1} + 4^{-2}}{4^{-3} + 4^{-2}}$$

$$= \frac{\frac{1}{4} + \frac{1}{16}}{\frac{1}{64} + \frac{1}{16}}$$

$$= \frac{\frac{4}{16} + \frac{1}{16}}{\frac{1}{64} + \frac{4}{64}}$$

$$= \frac{\frac{5}{16}}{\frac{5}{64}} = \frac{5}{16} \cdot \frac{64}{5} = 4$$

