Laws of Exponents and Scientific Notation Video Lecture

Sections 5.1 and 5.5

Course Learning Objective:

Use laws of exponents to simplify expressions with integer exponents.

Weekly Learning Objectives:

1) **Evaluate exponential expressions.**
2) **Use the product and quotient rule for exponents.**
3) **Use the power to a power rule for exponents.**
4) **Use the power rule for products and quotients.**
5) **Define a number raised to the 0 power.**
6) **Simplify expressions containing negative exponents.**
7) **Use all the rules and definitions for exponents to simplify exponential expressions.**
8) **Write numbers in scientific notation.**
9) **Convert numbers from scientific notation to standard form and vice versa.**
10) **Multiply and divide numbers in scientific notation.**

Laws of Exponents and Scientific Notation

Product Rule: $a^m \cdot a^n = a^{m+n}$ $\quad 7^3 \cdot 7^4 =$

Quotient Rule: $\frac{a^m}{a^n} = a^{m-n}$ $\quad \frac{2^2}{2^5} =$

Zero Exponent Rule: $a^0 = 1$ $\quad (-2)^0 =$

Power Rules: $(a^m)^n = a^{mn}$ $\quad (x^2)^3 =$

$(ab)^m = a^m b^m$ $\quad (3k)^4 =$

$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $\quad \left(\frac{2}{3}\right)^2 =$

Negative Exponent Rule: $a^{-n} = \frac{1}{a^n}$ $\quad 5^{-3} =$

or

$\frac{1}{a^{-n}} = a^n$ $\quad \frac{1}{x^{-3}} =$

How to simplify expressions involving exponents:

1) Distribute powers over products and quotients (get rid of parentheses)
2) Apply power to power rule
3) Flip around any negative exponents using negative exponent rule
4) Apply product or quotient rules to terms with like bases
5) Do any numerical calculations on coefficient numbers

$n^2 n^4 n =$

$(10a^2)(-3a^4) =$

$(y^4)^5 (y^3)^5 =$

$(3x^4y^2z)^3 (yz^4)^5 =$

$(-ts^6)^4 (-t^3 s^5)^3 =$

$\left(\frac{6x^3y^9}{z^5}\right)^4 =$

$\left(\frac{-2x^2y^4}{z^3}\right)^3 =$

Use positive exponents only

$2y^{-3} =$

$\left(\frac{1}{2}\right)^{-4} =$

$\frac{2^{-3}}{3^{-2}} =$

$\frac{a^{-m}}{b^{-n}} =$

$\frac{x^3}{x^5} =$

$\frac{a^6}{a^{-4}} =$

$\frac{3^8 y^5}{3^{10} y^2} =$

$\left(\frac{x^{-4} y^2}{z^{-5}}\right)^{-3} =$

$\left(\frac{-2 x^{-3} y^2}{y^{-3} x^5}\right)^{-3} =$

$$\left(\frac{-3x^3y^2}{y^3x^{-5}}\right)^2 =$$

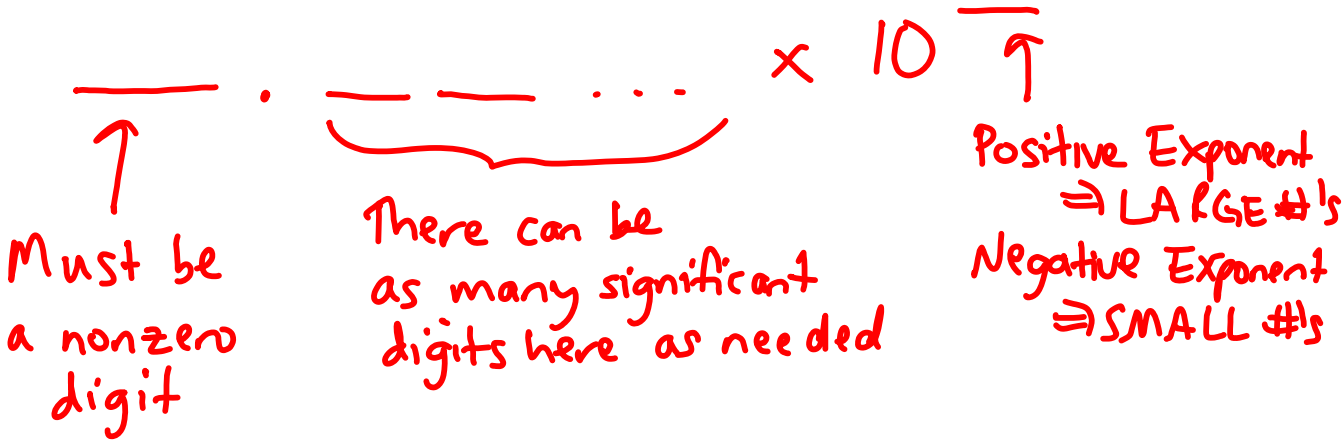
$$\frac{(-4x^{-3}y^2)^3}{(y^{-3}x^5)^{-3}} =$$

$$\frac{(-x^{-4}y^2z)^2}{(-2y^{-2}x^4z^{-2})^{-3}} =$$

Evaluate $x^{-2} + 3y^{-1}$ if $x = -3$ and $y = 2$

Scientific notation is used as a shorthand notation for very small or very large numbers.

General Form for scientific notation:



Use Scientific Notation for:

5600000 =

.007 =

9994000000 =

.00000575 =

Write in standard form:

$8.8 \times 10^{6} =$

$8.9 \times 10^{-5} =$

8.6×10^{0}

$(8 \times 10^{6}) \times (2 \times 10^{3}) =$

$(4 \times 10^{-3}) \times (2 \times 10^{7}) =$

$$\frac{12 \times 10^{-4}}{4 \times 10^{-3}} =$$

$$\frac{9.5 \times 10^{-1}}{5 \times 10^{3}} =$$