

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

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

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

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

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

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

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

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

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

$$n^2 n^4 n =$$

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

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

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

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

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

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

Use positive exponents only
 $2y^{-3} =$

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

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

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

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

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

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

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

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

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

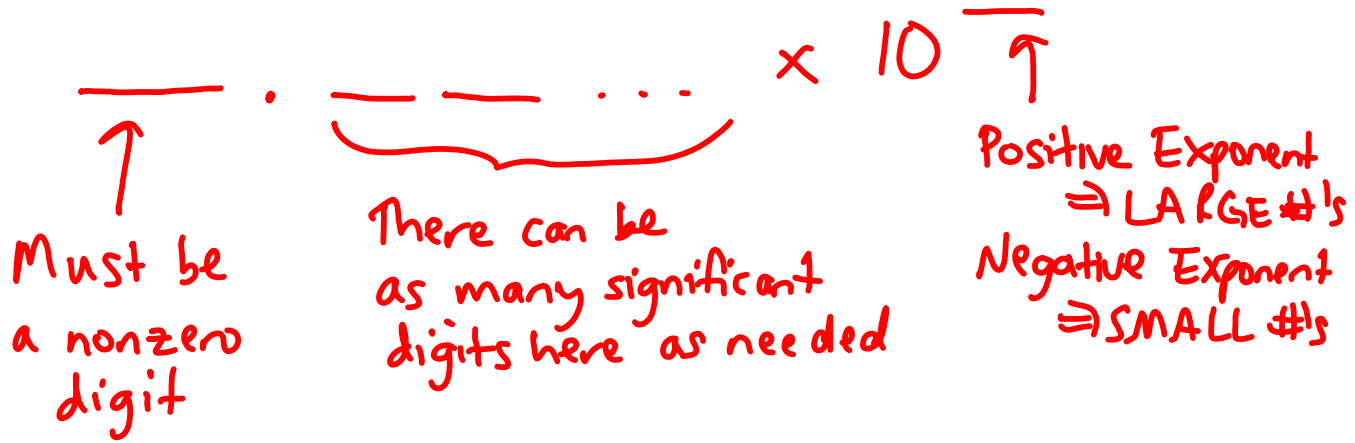
$$\frac{(-4x^{-3}y^2)^3}{(y^{-3}x^5)^{-3}} =$$

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

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:

$$5600000 =$$

$$.007 =$$

$$999400000 =$$

$$.00000575 =$$

Write in standard form:

$$8.8 \times 10^6 =$$

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

$$8.6 \times 10^0$$

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

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

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

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