6.7

Negative Exponents

(ex) $x^{-3} = \frac{1}{x^3}$

$\frac{1}{x^{-3}} = x^3$

In general, if you have a negative exponent me { 1. on top: put it on bottom, make it positive
2. on bottom: put it on top, make it positive

book: $x^{-n} = \frac{1}{x^n}$

(ex) $5^{-2} = \frac{1}{5^2}$

$(-5)^{-2} = \frac{1}{(-5)^2}$

$(2x^2y)^{-3} = \frac{1}{(2x^2y)^3}$

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

(ex) $(x^3x^4)^{-2} = \frac{1}{(x^3x^4)^2} = \frac{1}{(x^7)^2} = \frac{1}{x^{14}}$

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

$\frac{x^2}{x^5} = x^{2-5} = x^{-3} = \frac{1}{x^3}$

$\frac{x^{-2}x^{-1}}{x^{-3}x} = \frac{x^{-3}}{x^{-2}} = \frac{x^2}{x^3} = x^{2-3} = x^{-1} = \frac{1}{x}$

or $\frac{x^{-3}}{x^{-2}} = x^{-3+2} = x^{-1} = \frac{1}{x}$

or $\frac{x^3}{x^2xx} = \frac{x^3}{x^4} = x^{3-4} = x^{-1} = \frac{1}{x}$.

ex. $\frac{4x^{-2}}{y^{-3}} = \frac{4y^3}{x^2}$

$\frac{4x^{-3}y^2}{y^{-4}} = \frac{4y^2y^4}{x^3} = \frac{4y^6}{x^3}$

Scientific Notation

Really big or really small numbers are tedious too write so we use a shorthand called, scientific notation.

(ex) $120{,}000{,}000 = 1.2 \times 10^{8}$

$.000000012 = 1.2 \times 10^{-8}$

(7 zeros)

The idea

$120 = 1.2 \times 100 = 1.2 \times 10^{2}$

or

1.2×10^{2} move decimal point 2 places to right (fill in w/ 0's)

$1.20. = 120.$

1.2×10^{-2} move decimal point 2 places to left (fill in w/ 0's)

$.012 = .012$

In general, 10^{n}

if n is pos. move decimal n to the right

if n is neg. move decimal n to the left.

fill in zeros.

(ex) $1.5 \times 10^{6} = 1{,}500{,}000.$

$1.5 \times 10^{-6} = .000001.5$

Writing Scientific Notation

1. Move decimal point until one digit to the left (count the moves)
2. write $\times 10^{\#\text{ of moves}}$
3. decide + or −

ex) 1.2300000.

made 7 moves

1.23×10^{7}

.000000004

made 9 moves

$4. \times 10^{-9}$

Using Scientific Notation to Simplify

ex $4.92 \times 10^{-9} \cdot 1.2 \times 10^{20} = 4.92 \times 1.2 \times 10^{-9} \times 10^{20} = 5.904 \times 10^{11}$

$$(4.3 \times 10^{-8})^2 = 18.49 \times 10^{-16}$$
$$= 1.849 \times 10^{1} \times 10^{-16}$$
$$= 1.849 \times 10^{-15}$$

$$\frac{4 \times 10^{8}}{2 \times 10^{6}} = 2 \times 10^{8-6} = 2 \times 10^{2}$$