Laws of Exponents

UNIVERSITY OF MINNESOTA

Preliminaries and Objectives

Preliminaries
- The notation of exponents

Objectives
- Laws of Exponents

Positive Exponents

$$(10)(10)(10)(10)(10)(10)(10) = 10^7$$

Negative Exponents

$$
\begin{aligned}
10^4 &= 10 \cdot 10 \cdot 10 \cdot 10 &&= 10,000 \\
10^3 &= 10 \cdot 10 \cdot 10 &&= 1000 \\
10^2 &= 10 \cdot 10 &&= 100 \\
10^1 &= 10 &&= 10 \\
10^0 &= &&= 1 \\
10^{-1} &= &&= \frac{1}{10} = \frac{1}{10^1} \\
10^{-2} &= &&= \frac{1}{100} = \frac{1}{10^2}
\end{aligned}
$$

Multiplication $=$ Adding Exponents

$$\left(b^3\right)\left(b^4\right)$$

$$\left(b \cdot b \cdot b\right) \cdot \left(b \cdot b \cdot b \cdot b\right) \;=\; b^7$$

$$b^3 \cdot b^4 = b^{3+4} \;=\; b^7$$

Division $=$ Subtracting Exponents

$$\frac{b^2}{b^6} \;=\; \frac{b \cdot b}{b \cdot b \cdot b \cdot b \cdot b \cdot b}$$

$$\;=\; \frac{1}{b \cdot b \cdot b \cdot b} = \frac{1}{b^4}$$

$$\;=\; b^{-4}$$

Recap

$$b^1 \;=\; b$$

$$b^0 \;=\; 1$$

$$b^{-x} \;=\; \frac{1}{b^x}$$

$$b^x \cdot b^y \;=\; b^{x+y}$$

$$\frac{b^x}{b^y} \;=\; b^{x-y}$$

$$\left(b^x\right)^y \;=\; b^{x \cdot y}$$