6.2 – 6.3 Properties of Exponents

KEY CONCEPT *For Your Notebook*

Properties of Exponents

p. 330

Let a and b be real numbers and let m and n be integers.

Property Name	Definition	Example
Product of Powers	$a^m \cdot a^n = a^{m+n}$	$5^3 \cdot 5^{-1} =$ $5^{3+-1} = 5^2$
Power of a Power	$(a^m)^n = a^{mn}$	$(3^3)^2 =$ 3^6
Power of a Product	$(ab)^m = a^m b^m$	$(2 \cdot 3)^4 =$ $2^4 \cdot 3^4$
Negative Exponent	$a^{-m} = \frac{1}{a^m}, a \neq 0$	$7^{-2} =$ $\frac{1}{7^2} = \frac{1}{49}$
Zero Exponent	$a^0 = 1, a \neq 0$	$(-89)^0 =$ $= 1$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$	$\frac{6^{-3}}{6^{-6}} =$ $6^{-3--6} = 6^3$
Power of a Quotient	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$	$\left(\frac{4}{7}\right)^2 =$ $\frac{4^2}{7^2}$

Evaluate the expression.

a. $(-3^2 \cdot 5)^3 = (-45)^3 = -91{,}125$

b. $\left(\frac{1^4}{3^2}\right)^{-2} = \left(\frac{1}{9}\right)^{-2} = \frac{1^{-2}}{9^{-2}} = \frac{9^2}{1^2} = \frac{81}{1} = 81$

Shortcut: negative exponent ⟩ change level … make positive

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

$\frac{a^{-3}b^2}{c^{-4}} = \frac{b^2c^4}{a^3}$

Simplify the expression.

a. $w^5 w^{-8} w^6 = w^3$

b. $\left(\frac{c}{d^{-4}}\right)^{-2} = \left(\frac{d^{-4}}{c}\right)^2 = \frac{d^{-8}}{c^2} = \frac{1}{c^2 d^8}$

c. $\frac{a^{-3} b^2}{a^5} = \frac{a^{-3}\ b^2}{a^5} = a^{-8} b^2 = \frac{b^2}{a^8}$

What is the simplified form of $\left(\frac{a^2b^{-1}}{2a^3b^2}\right)^3$?

$= \frac{a^6 b^{-3}}{2^3 a^9 b^6} = \frac{a^{-3} b^{-9}}{8}$

$= \frac{1}{8 a^3 b^9}$

Scientific Notation

$(1.2 \times 10^{-3})(6.7 \times 10^{-7}) = (1.2)(6.7) \times 10^{-10}$

8.04×10^{-10}

$$\frac{1.1 \times 10^{-3}}{5.5 \times 10^{-8}} = \frac{1.1}{5.5} \times 10^{5}$$

0.2×10^{5}

2×10^{4}

HW = p. 333/ # 1, 2, (3 - 36 mult of 3), 37 - 39, 50, 52, 61, 62

Due Thursday

12. $\left(\frac{2}{3}\right)^{-5}\left(\frac{2}{3}\right)^{4} = \left(\frac{3}{2}\right)^{5} \cdot \left(\frac{2}{3}\right)^{4} = \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} \cdot \frac{2 \cdot 2 \cdot 2 \cdot 2}{3 \cdot 3 \cdot 3 \cdot 3} = \frac{3}{2}$

27. $(w^3x^{-2})(w^6x^{-1})$

$w^3 \cdot w^6 \cdot x^{-2} \cdot x^{-1}$

$w^9 \cdot x^{-3}$

$\frac{w^9}{x^3}$