

6.2 – Laws of Exponents

THE POWER LAWS

Consider a typical “power” a^n . We call “ a ” the a . We call “ n ” the n .
and the entire expression a^n is called a a^n .

The Laws: Given the powers a^m and a^n , with exponents m and n , and the number $\frac{a}{b}$, then

1)

2)

3)

4)

5)

Example 6.2.1

Simplify (express as a single power):

a) $(4)^{-5} \times 4^7$

b) $x^e + x^{-e}$

c) $\frac{7^3}{7^p}$

d) $(5^2)^2$

e) $b^3 b^5 b^{-7}$

f) $\left(\frac{4}{3}\right)^5 \times \left(\frac{4}{3}\right)^{53}$

6.2 – Laws of Exponents

THE POWER LAWS

Consider a typical “power” a^n . We call “ a ” the **base**. We call “ n ” the **exponent** and the entire expression a^n is called a **power**.

→ **The Laws:** Given the powers a^m and a^n , with exponents m and n , and the number $\frac{a}{b}$, then

eg. $a^3 \times a^2 = a^5$ 1) $a^m \times a^n = a^{m+n}$ multiplication law

$a^5 \div a^4 = a^1$ 2) $a^m \div a^n = a^{m-n}$ division law

$(a^4)^3 = a^{12}$ 3) $(a^m)^n = a^{mn}$ power law

$\left(\frac{a}{b}\right)^4 = \frac{a^4}{b^4}$ 4) $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ power of a quotient

5) $(a)^0 = 1$ power of zero

Example 6.2.1

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Example 6.2.1

Simplify (express as a single power):

a) $(4)^{-5} \times 4^7$

$= 4^{-5+7}$
 $= 4^2$

b) $x^4 \div x^{-2}$

$= x^{4-(-2)}$
 $= x^6$

c) $\frac{7^3}{7^9}$

$= 7^{3-9}$
 $= 7^{-6}$
 $= \frac{1}{7^6}$

d) $(5^3)^2$

$= 5^6$

e) $b^3 b^5 b^{-7}$

$= b^1$

f) $\left(\frac{4}{3}\right)^5 \times \left(\frac{4}{3}\right)^{53}$

$= \left(\frac{4}{3}\right)^{58}$

Example 6.2.2

Simplify, then evaluate each expression:

7^{-3}

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$$\text{a) } 3^5 (3^{-2})$$

$$= 3^3$$

$$\text{b) } (2^{-3} (2^4))^5$$

$$= (2^1)^5$$

$$= 2^5$$

$$\text{c) } \frac{7^{-3}}{(7^2)^{-4}}$$

$$= \frac{7^{-3}}{7^{-8}}$$

$$= 7^{-3 - (-8)}$$

$$= 7^5$$

Example 4.2.3

Evaluate:

$$\text{a) } \left(\frac{3}{5}\right)^4$$

$$= \frac{81}{625}$$

$$\text{b) } (1.36)^4$$

$$= 3.42102016$$

$$\text{c) } -3^6$$

$$= -729$$

$$\text{d) } (-3)^6$$

$$= 729$$