

Review From Gr.9



LAWS OF EXPONENTS

Laws Of Exponents



Law #1: Product Rule

$$b^m \times b^n = b^{m+n}$$

- when multiplying powers with the same base you add the exponents

Examples: $5^3 \times 5^6 = 5^{3+6} = 5^9$

$$(z^6)(z^4) = z^{6+4} = z^{10}$$

Exercise:

Simplify the following using the laws of exponents

a) $3^2 \times 3^4$
 3^6

b) $4^3 \times 3^4$

c) $(q^7)(q^1)$
 q^8

d) $p \times p^3 \times p^2$
 p^6

e) $(2x^3)(4x^2)$
 $8x^5$

f) $(3z^3)(6z^{12})$
 $18z^{15}$

Law #2: Quotient Rule

$$b^m \div b^n = b^{m-n}$$

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

- when dividing powers with the same base you subtract the exponents

Examples:

$$7^5 \div 7^2 = 7^{5-2} = 7^3$$

$$3 \times 2 = 6$$

$$2 \times 3 = 6$$

$$3 \div 1 = 3$$

$$1 \div 3 = 0.\bar{3}$$

$$\frac{g^{13}}{g^4} = g^{13-4} = g^9$$

$$\frac{g^4}{g^{13}} = g^{-9}$$

Exercise:

Simplify the following using exponent laws

a) $5^{23} \div 5^{12}$
 5^{11}

b) $\frac{x^{34}}{x^{19}} = x^{15}$

c) $c^3 \div e^2$

d) $\frac{12x^3}{4x}$

e) $\frac{25c^{30}}{5c^{23}} = 5c^7$

Law #3: Power Rule

when raising a power to another power...MULTIPLY the exponents."

$$(b^m)^n = b^{mn}$$

Law #4: Power of Product

when a product is raised to a power, each of the factors are raised to the power."

$$(ab)^m = a^m b^m$$

- when brackets are involved you must multiply the exponents

Examples:

$$(5^3)^5 = 5^{(3)(5)} = 5^{15}$$

$$(m^8)^4 = m^{(8)(4)} = m^{32}$$

$$(e^2 f)^3 = e^{(2 \times 3)} f^{(1 \times 3)} = e^6 f^3$$

Exercise:

Simplify the following using Laws of Exponents

a) $(m^3)^4$

b) $(x^2 y^4)^3$

c) $(2d^3)^3$

d) $(2m^4 n)^2 (m^3 n^2)$

Law #5: Power of Quotient Rule

when a quotient is raised to a power, both the divisor and the dividend are raised to the power."

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\left(\frac{x^2}{y^7}\right)^3 = \frac{x^6}{y^{21}}$$

Examples:

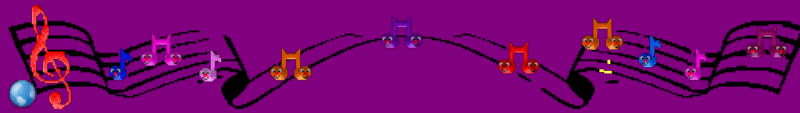
$$\left(\frac{2}{3}\right)^5 = \frac{2^5}{3^5}$$

Law #6: Zero Rule

$$b^0 = 1$$

- any power raised to the exponent 0 (zero) is equal to 1

Exponent Laws



Laws of Exponents

Product of powers law: $a^m \cdot a^n = a^{m+n}$

Quotient of powers law: $\frac{a^m}{a^n} = a^{m-n}$

Power of a power law: $(a^m)^n = a^{mn}$

Write as a single power.

a) $3^2 \cdot 3^5 = 3^7 = 2187$

b) $(4^2)^5 = 4^{10}$

c) $(-5)^{10} \div (-5)^8 = (-5)^2$

Answers to Laws of Exponents Review

1) 2^6

2) $\frac{1}{2^8}$

3) $\frac{1}{2^2}$

4) 2^{27}

5) $\frac{1}{8x^8}$

6) $\frac{2}{n^2}$

7) $\frac{y^8 x^{23}}{4}$

8) $\frac{m^9}{4n^4}$

9) $\frac{4}{y^3 x^4}$

10) $\frac{8x}{y}$

1. $(6m^3)(5m^3)$

2. $\frac{2n^3}{(3n)(4n^3)}$

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

3. $(6x^3 y^2)(yx^2)$

5. $(2x^4)^2$

6. $\frac{(4x^3 y^2)(2x^2 y^5)^3}{2x^3 y}$

$$\frac{4x^3 y^2 \cdot 8x^6 y^{15}}{2x^3 y}$$

$9 = 3$

$32x^9 y^{17} x^3$

$2x^3 y$

$16x^{12} y^{16}$