

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: $5^3 \times 5^6 = \quad =$

$$(z^6)(z^4) = \quad =$$

Exercise:

Simplify the following using the laws of exponents

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

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

c) $(q^7)(q)$

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

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

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

Law #2: Quotient Rule

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

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

Examples:

$$7^5 \div 7^2 = \quad =$$

$$\frac{5g^{13}}{g^4} = \quad =$$

Exercise:

Simplify the following using exponent laws

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

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

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

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

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

Law #3: Power Rule

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

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

(Handwritten example: $(2xy^2)^3$ with arrows pointing from the 3 to the 2 and the 2)

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:

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

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

$$(e^2 f^3)^3 = e^6 f^9 =$$

Exercise:

Simplify the following using Laws of Exponents

a) $(m^3)^4$

m^{12}

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

$x^6 y^9$

c) $(2d^3)^9$

$2^9 d^{27}$

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

*$(2^2 m^8 n^2)(m^3 n^2)$
 $4m^{11} n^4$*

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

$$\frac{4}{9} \quad \left(\frac{2}{3}\right)^2$$

$$\sqrt[2]{25}$$

$$\sqrt{\frac{9}{25}} = 0.6$$

$$\frac{\sqrt{9}}{\sqrt{25}} = \frac{3}{5}$$

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."

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

Examples:

$$\left(\frac{2}{3}\right)^5 = \frac{2^5}{3^5} = \frac{32}{243}$$

Law #6: Zero Rule

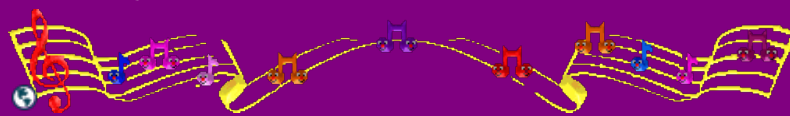
$$b^0 = 1$$

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

$$c^0 = 1 \quad \left(\frac{x^2 y^{476}}{243abc}\right)^0 = 1$$

$$900^0 = 1$$

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

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

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



4.4 Fractional Exponents and Radicals

Laws of Exponents Review

Simplify. Your answer should contain only positive exponents.

1) $\left(\frac{2 \cdot 2^2}{2}\right)^3$
 $\left(\frac{2^3}{2}\right)^3 = \frac{2^9}{2^3} = 2^6$

2) $\frac{2^2 \cdot 2^{16}}{2^3 \cdot 2^7}$
 $\frac{2^{18}}{2^{10}} = 2^8 = 256$

3) $\frac{2^2}{4^2}$

4) $\frac{(2^3 \cdot 2^4)^2}{2}$
 $\frac{2^{14}}{2} = 2^{13} = 8192$

5) $\frac{2x^2}{(2x^2)^4 x^3}$
 $\frac{2x^2}{16x^8 x^3} = \frac{2x^2}{16x^{11}} = \frac{1}{8x^9}$

6) $\frac{2n^2}{(n^2)^2 n^0}$
 $\frac{2n^2}{n^4} = 2n^{-2} = \frac{2}{n^2}$

7) $\frac{(3x^2)^4 (x^2 y^3)^2}{2x^8 \cdot 2y^4}$
 $\frac{81x^8 \cdot x^4 y^6}{4x^8 y^4} = \frac{81x^4 y^2}{4}$

8) $\frac{(nm^2)^3}{2n^4 \cdot 2m^3 n^2}$
 $\frac{n^3 m^6}{4n^6 m^3} = \frac{m^3}{4n^3}$

9) $\frac{2x^2 y^3}{(x^2 y)^5}$
 $\frac{2x^2 y^3}{x^4 y^5} = \frac{2x^{-2} y^{-2}}{1} = \frac{2}{x^2 y^2}$

10) $\frac{(2x^2)^3}{2yx^2 \cdot x^3}$
 $\frac{8x^6}{2x^5 y} = \frac{4x}{y}$

1) $x^5 \cdot x^2$

6) $(x^2 y^4 m^3)^8$

2) $7x^3 y^2 \cdot 5x y^9$

7) $(2ab)^5$

3) $a^{10} \cdot a^2 \cdot a^{-6}$

8) $\left(\frac{m^3 p^5}{n^7}\right)^6 \left(\frac{m^2 n^0 p^3}{m^4 p^2}\right)^3$

4) $(z^5)^5$

9) $p^2 \cdot (p^5)^2$

5) $(m^{-8})^{-3}$

10) $\frac{5x^{-4}}{x^{-9}}$