Unit 8 Notes

LAWS OF EXPONENTS

Product of Powers Property	$a^m \cdot a^n = a^{m+n}$

Examples

1. $r(r^5)$
2. $n^2 \cdot n^8$
3. $3^4 \cdot 3$
4. $ab^4 \cdot a^3b^2$
5. $(3h^3p)(2h^2p)$
6. $(3y^2)(-5y^7w^2)$

Explain this property in your own words…

Try These

Simplify each product.

1. $10^2 \cdot 10^3$
2. $a^7 \cdot a^{12}$
3. $c^3(c^8)$
4. $d^7 \cdot d^9$
5. $4x^2(2x^{11})$
6. $2^x \cdot 2^y$
7. $(-3x^2y)(-4x^3y^2)$
8. $(-3a^2b^2)(6ab^4)$
9. $(7q^5)(11q^3r^5)$
10. $(11c^8d)(-10c^4d)$
11. $(9x^{10}z^2)(5x^5y^3)$
12. $(-8m^6n)(-7m^2n^5)$

Power of a Product Property	$(ab)^m = a^m b^m$

Examples

1. $(xy)^3$
2. $(2w)^4$
3. $(-3ab)^2$
4. $(-w)^3$

Explain this property in your own words…

Try These

Simplify each product.

1. $(2n)^3$
2. $(-a)^5$
3. $(wxy)^4$
4. $(-2d)^4$
5. $(4mn)^3$
6. $(-abc)^2$

Remember…

A negative number to an **odd** power is **negative**.	A negative number to an **even** power is **positive**.
$(-\blacksquare)^{\text{odd}} = -\blacksquare$	$(-\blacksquare)^{\text{even}} = +\blacksquare$

Power of a Power Property	$(a^m)^n = a^{m \cdot n}$

Examples

1. $(x^2)^7$
2. $(3w^5)^2$
3. $(w^4y^2)^3$
4. $(-2n^5)^2$
5. $(-p^2d^5)^4$
6. $(-2ab^3)^3$

Explain this property in your own words…

Try These

Simplify each expression.

1. $(4y)^2$
2. $(3^2)^3$
3. $(-y^5)^4$
4. $(a^2)^5$
5. $(2x^5)^4$
6. $(ab^3)^5$
7. $(-8c^7)^2$
8. $(-3h^9)^3$
9. $(-m^4n^5)^8$
10. $(-5x^5y^6)^3$
11. $(10abc^3)^2$
12. $(-4m^2np^3)^3$

Negative Exponent Property	$$a^{-m} = \frac{1}{a^m}$$

Examples

1. x^{-4}
2. 3^{-3}
3. $5a^{-2}$
4. $(5a)^{-2}$
5. a^4b^{-5}
6. $\frac{y^{-6}}{4}$
7. $-2x^{-5}$
8. $\frac{2}{n^{-4}}$
9. $\frac{8}{2m^{-3}}$

Explain this property in your own words…

Try These

Simplify each product.

1. 6^{-2}
2. $4x^{-6}$
3. $(-3)^{-2}$
4. $a^{-3}b$
5. $2n^{-2}$
6. $\frac{5}{x^{-1}}$
7. $\frac{3g^{-3}}{f^{-2}}$
8. $\frac{-2a^4}{b^{-5}}$
9. $\frac{10x^{-6}}{-2f^{-4}}$

Zero Exponent Property	$a^0 = 1$

Examples

1. 5^0
2. x^0
3. $(3x^4)^0$
4. $6a^0$
5. $\frac{(3x^2)^0}{y}$
6. $(6a^3)(-3a^2)^0$

Explain this property in your own words…

Try These

Simplify each expression.

1. y^0
2. $2m^{-2}n^0$
3. $(x^2y^3)^0$
4. $a^{-1}b^{-2}c^3$
5. m^5n^{-2}
6. $(4x)^2(-3x^2)^0$
7. $\frac{3y^{-6}}{y^2}$
8. $\frac{7^0}{-2(xy)^2}$
9. $3a^3b^0c^{-2}$

Quotient of Powers Property	$\frac{a^m}{a^n} = a^{m-n}$

Examples

1. $\frac{2^6}{2^2}$

2. $\frac{x^{10}}{x^3}$

3. $\frac{w^6}{w^{11}}$

4. $\frac{x^3y^7}{x^2y^3}$

5. $\frac{10a^2b^9}{2a^5b^4}$

6. $\frac{4d^3c^{11}}{-12a^2c^2d^7}$

Explain this property in your own words…

Try These

Simplify each expression.

1. $\frac{n^8}{n^2}$

2. $\frac{3^7}{3^5}$

3. $\frac{5x^8y^5}{15x^9y^2}$

4. $\frac{-36ab^9c^2}{-6ab^3c^7}$

Power of Quotient Property	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

Examples

1. $\left(\frac{w}{y}\right)^4$
2. $\left(\frac{3}{x^4}\right)^2$
3. $\left(\frac{a^2}{b}\right)^3$
4. $\left(\frac{y^5}{y^2}\right)^4$

Explain this property in your own words…

Try These

Simplify each expression.

1. $\frac{x^7}{x^5}$
2. $\frac{3^2}{3^5}$
3. $\frac{a^{10}}{a^{14}}$
4. $\frac{x^5}{x}$
5. $\frac{x^a}{x^c}$
6. $\left(\frac{y^5}{-4}\right)^2$
7. $\left(\frac{a^4}{b^2}\right)^3$
8. $\frac{a^5b^7}{a^2b^{10}}$
9. $\frac{h^3k^7}{h^2k^4}$
10. $\frac{-8a^3b^7}{2a^4b}$
11. $\frac{4x^3yz^4}{8x^5z^2}$
12. $\left(\frac{-5x}{y^6}\right)^3$

Using Multiple Exponent Laws

Examples

1. $\frac{2x^3y^5}{8x^2y^{-2}}$

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

3. $\left(\frac{6x^6}{24x^4}\right)^3$

4. $(x^2)^3(-2x^4y)^5$

Try These

Simplify each expression.

1. $(k^9)^5(k^3)^2$

2. $(4x^3)^2(-2xy^3)^3$

3. $(-3a^3b^2)^2(2ab^3)^3$

4. $\frac{(4h^4k^{-3})(-3h^{-2}k)^2}{8h^6k^2}$

5. $\frac{(7d^{-6})(-4d^{-2})}{2d^{-4}}$

6. $\left(\frac{-6x^5y^2}{-36x^2y^4z}\right)^3$

7. $\frac{(-6a^3b^2)^2}{4a^4b}$

8. $\frac{15(-x^2)^4}{(5xy^3)^2}$