

4.1 EXPONENT RULES

Rule 1: When multiplying like bases, keep the same base and add the exponents.

$$x^2x^3 = x^5$$

$$2^3 \cdot 2^4 = \underline{\hspace{2cm}}$$

Rule 2: When raising a power to a power, keep the same base and multiply the exponents.

$$(x^2)^3 = x^6$$

$$(a^4)^5 = \underline{\hspace{2cm}}$$

Rule 3: When dividing like bases, keep the same base and subtract the exponents. Put base where the largest exponent was. Get positive exponents before using this rule.

$$\frac{x^5}{x^2} = x^3$$

$$\frac{x^2}{x^5} = \frac{1}{x^3}$$

Rule 4: When raising a product to a power, raise each factor to that power.

$$(xy)^3 = x^3y^3$$

$$(3x)^2 = 3^2x^2 = \underline{\hspace{2cm}}$$

Rule 5: When raising a fraction to a power, raise both the numerator and denominator to that power.

$$\left(\frac{a}{b}\right)^4 = \frac{a^4}{b^4}$$

$$\left(\frac{3}{x^2}\right)^4 = \underline{\hspace{2cm}}$$

Rule 6: A non-zero number raised to the zero power is 1.

$$x^0 = 1$$

$$4^0 = \underline{\hspace{2cm}}$$

$$(-4x)^0 = \underline{\hspace{2cm}}$$

$$4x^0 = \underline{\hspace{2cm}}$$

Rule 7: Even or Odd Rule: (a) A negative base raised to an even power is positive.
(b) A negative base raised to an odd power is negative.

$$(-1)^{14} = 1$$

$$(-1)^{13} = -1$$

$$(-1)^{12} = \underline{\hspace{2cm}}$$

$$(-1)^9 = \underline{\hspace{2cm}}$$

(Rules 8 and 9 will be used on the next section.)

Rule 8: To change the sign of an exponent, move it (along with its base) across the fraction bar.

$$\frac{1}{x^{-3}} = x^3$$

$$x^{-3} = \frac{1}{x^3}$$

Rule 9: $\left(\frac{\Delta}{X}\right)^{-\text{exp.}} = \left(\frac{X}{\Delta}\right)^{+\text{exp.}}$

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

which simplifies to: $\frac{16}{x^2}$

Simplify as completely as possible.

1. $2^2 \cdot 2^4$

2. $a^3 a^2 a$

3. $(2x)^8 (2x)^5$

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

5. $(a^3)^4$

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

7. $(2x^3y)^4(3x^4y)$

8. $\frac{4^3}{4^2}$

9. $\frac{(a+2)^4}{(a+2)^9}$

10. $\frac{6y^5}{2y^8}$

11. 5^0

12. $(-2a)^0$

13. $-2a^0$

14. $x^5 x^2 x^0$

15. $\left(\frac{3}{x^5}\right)^2$

16. $\left(\frac{3x^2}{-2y^4}\right)^3$

17. $(2x)^{-1}$

18. $2x^{-1}$

19. $(-x)^9$

20. $(-x)^6$