

Polynomials

Raising Exponents to a Power and Multiplying Exponents

$$\text{Rule: } (x^a)^b = x^{ab} \quad \text{Example: } (x^2y^3)^3 = x^6y^9$$

$$\text{Rule: } x^a \cdot x^b = x^{a+b} \quad \text{Example: } x^3 \cdot x^5 = x^8$$

Multiply the polynomials.

$$1. (-4xy^3)^3 = (-4)^3 x^3 y^9 \\ = -64x^3y^9$$

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

$$3. (-6x^4y^6)^3 = (-6)^3 x^{12} y^{18} \\ = -216x^{12}y^{18}$$

$$4. (5x^2y^4)^3 = 5^3 x^6 y^{12} \\ = 125x^6y^{12}$$

$$5. (6x^5y^4)^3 = (6)^3 x^{15} y^{12} \\ = 216x^{15}y^{12}$$

$$6. (2x)^4 = 2^4 x^4 \\ = 16x^4$$

$$7. (-3x^2y)^3 = (-3)^3 x^6 y^3 \\ = -27x^6y^3$$

$$8. (x^3y)^2 = x^6y^2$$

$$9. (-2x^2y)^4 = (-2)^4 x^8 y^4 \\ = 16x^8y^4$$

$$10. (x^2y^3)(x^3y^2) = x^5y^5$$

$$11. (-4x^3y^3)^4 = (-4)^4 x^{12} y^{12} \\ = 256x^{12}y^{12}$$

$$12. (3xy^3)(-4x^2y^4)(xy^3) = [3xy^3][(-4)^2x^4y^8][xy^3] \\ = 3xy^3(16x^4y^8)(xy^3) \\ = 48x^6y^{14}$$

$$13. (-3x^3y)^3 = (-3)^3 x^9 y^3 \\ = -27x^9y^3$$

$$14. (-2x^4y^5)^3 = (-2)^3 x^{12} y^{15} \\ = -8x^{12}y^{15}$$

$$15. (3x^2y^3)^4 = (3)^4 x^8 y^{12} \\ = 81x^8y^{12}$$

$$16. (6x^2y^3)^0 = 1$$

$$17. (x^3y^3)^3 = x^9y^9$$

$$18. (5xy^3)(-5xy^2) = -25x^2y^5$$

$$19. (-3x^2y^3)^2 = (-3)^2 x^4 y^6 \\ = 9x^4y^6$$

$$20. (8xy)^2 = 8^2 x^2 y^2 \\ = 64x^2y^2$$

Polynomials

Negative Exponents

Rule: $x^{-a} = \frac{1}{x^a}$

Example: $4^{-2} = \frac{1}{16}$

Example: $4x^{-2} = \frac{4}{x^2}$

Example: $(2x)^{-3} = \frac{1}{8x^3}$

$$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

$$\frac{1}{(2x)^3} = \frac{1}{8x^3}$$

Simplify.

1. $4cd^{-5} = \frac{4c}{d^5}$

2. $3a^{-6} = \frac{3}{a^6}$

3. $3a^4b^{-3} = \frac{3a^4}{b^3}$

4. $4^{-5} = \frac{1}{4^5} = \frac{1}{1024}$

5. $(-2)^{-2} = \frac{1}{(-2)^2} = \frac{1}{4}$

6. $(3xy)^{-1} = \frac{1}{3xy}$

7. $(3x)^{-3} = 3^{-3}x^{-3} = \frac{1}{3^3x^3} = \frac{1}{27x^3}$

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

9. $-2x^{-3} = \frac{-2}{x^3}$

10. $(6y^2)^{-2} = \frac{1}{(6y^2)^2} = \frac{1}{6^2y^4} = \frac{1}{36y^4}$

11. $\left(\frac{4}{5}\right)^{-2} = \frac{4^{-2}}{5^{-2}} = \frac{5^2}{4^2} = \frac{25}{16}$

12. $4m^3n^{-5} = \frac{4m^3}{n^5}$

13. $(-11x^3y)^{-2} = (-11)^{-2}x^{-6}y^{-2} = \frac{1}{(-11)^2x^6y^2} = \frac{1}{121x^6y^2}$

14. $(c^2d)^{-2} = c^{-4}d^{-2} = \frac{1}{c^4d^2}$

15. $14x^{-8}y = \frac{14y}{x^8}$

16. $(-5x^3)^{-2} = (-5)^{-2}x^{-6} = \frac{1}{(-5)^2x^6} = \frac{1}{25x^6}$

17. $\left(\frac{x^2}{y^3}\right)^{-2} = \frac{x^{-4}}{y^{-6}} = \frac{y^6}{x^4}$

18. $\left(\frac{2}{3}\right)^{-1} = \frac{2^{-1}}{3^{-1}} = \frac{3}{2}$

19. $b^{-5} = \frac{1}{b^5}$

20. $c^{-7} = \frac{1}{c^7}$