

Exponents

Examples:

RULES:

1. Product Rule

For any base x , $x^m \cdot x^n = x^{m+n}$

2. Power Rule

For any base x , $(x^m)^n = x^{m \cdot n}$

3. Power of a Product Rule

For any bases x and y , $(xy)^n = x^n y^n$

4. Quotient Rule

For any base x , $\frac{x^m}{x^n} = x^{m-n}$

5. Zero Exponent Rule

For any base x , $x^0 = 1$

6. Power of a Quotient Rule

For any bases x and y , $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$

Homework: pg. 312 #1 – 79 (every other odd – 1, 5, 9, ...)

Examples:

For the following questions, simplify and state the rule(s) used.

1. $3^5 \cdot 3^7$

2. $(a^5 b^3)^8$

3. $\frac{x^{20}}{x^5}$

4. $\left(\frac{p}{q}\right)^3$

5. $(3x^2)^0$

6. $9x^0$

7. $\frac{x^5}{x^5}$

8. $x^5 \cdot x^6 \cdot x^3$

9. $(a^6 b^5)(a^9 b^5)$

10. $(4a^2 b^3)^3 (a^4 b^2 c^7)^5$

11. $k^{24} \div k^8$

12. $\frac{20a^{10} b^{12} c^{15}}{5a^2 b^6 c^9}$

13. $\left(\frac{a^2 b^7}{ad^4}\right)^5$

14. For $f(x) = x^3$, find $f(-4)$

15. For $f(x) = x^7$, find $f(a^8)$

Negative Exponents; Scientific Notation

For any nonzero base x , $x^{-n} = \frac{1}{x^n}$.

Examples:

1. $\frac{5^6}{5^9}$

2. a^5b^{-4}

3. $\frac{x^{12}}{x^{-7}}$

4. $\frac{x^{12}}{y^{-7}}$

5. $\frac{x^{-2}y^4}{z^{-1}w^{-9}}$

6. $x^{-13} * x^6$

7. $(x^{-6})^{-7}$

8. $(9ab^{-3}c^2)^{-2}$

9. $\left(\frac{x^5}{y^{-4}}\right)^{-4}$

Scientific Notation:

Write a number in the form $a \times 10^b$, where a is between 1 and 10 (inclusive) and b is an integer.

Examples:

1. Convert from Scientific Notation to Decimal Notation.

- a. 3.2×10^6

- b. 7.21×10^{-4}

2. Convert from Decimal Notation to Scientific Notation.

- a. 0.0046

- b. 3,570,000

3. Multiply or divide. Put all answers in Scientific Notation.

- a. $(5.8 \times 10^4)(12 \times 10^9)$

- b. $(9.9 \times 10^5) \div (3.3 \times 10^{-7})$

4. The Intel Pentium 4 chip performs 4.2×10^7 calculations per second. How many calculations can it perform in one year (31,536,000 seconds)?

Homework: pg. 321

#3,7,11,13,15,17,21,23,25,27,31,35,39,41,43,49,51,53,55,57,59,61,63,65,67,69,71

Polynomials: Addition and Subtraction of Polynomials

Polynomials in a Single Variable

The sum of terms of the form ax^n , where a is a real number and n is a whole number

Examples:

$$x^2 - 9x + 14$$

$$4x^5 - 13$$

$$x^7 - 4x^5 + 8x^2 + 13x$$

Examples:

State the degree of the term

1. $4x^3$

2. $-6x^7$

3. $8x$

4. 5

Special Polynomials: Monomial, Binomial, Trinomial

Examples:

Classify each polynomial as a monomial, binomial, or trinomial.

1. $x^2 - 9x + 20$

2. $x^2 - 81$

3. $-92x^7$

Examples:

Find the degree of the polynomial

1. $x^3 - 6x^2 - 11x + 32$

Example:

Rewrite the polynomials in descending order. Identify the leading term and the leading coefficient. State the degree of the polynomial.

1. $x + 9 + 4x^2 - x^3$

2. $5x^2 - 3x^4 + 17x$

Polynomial Functions:

Examples:

1. Evaluate $x^4 - 5x^3 - 6x^2 + 10x - 21$ at $x = -1$

2. Find $f(-2)$ if $f(x) = x^3 + 12x^2 - 21x$

Adding and Subtracting Polynomials:

Examples:

1. $(x^3 - x^2 - 9x + 25) + (x^2 + 12x + 144)$

2. $(5x^2 + 6x + 27) - (3x^3 + 6x^2 - 9x + 22)$

3. Given $f(x) = 4x^2 + 30x - 45$ and $g(x) = -2x^2 + 17x + 52$; find $f(x) - g(x)$

Polynomials in Several Variables

$$x^2y^2 + 3xy - 10; 7a^3 - 8a^2b + 3ab^2 - 15b^3; x^2 + 2xh + h^2 + 5x + 5h$$

Examples:

1. Find the degree of each term and the degree of the polynomial

- a. $x^5 - 3x^2y^6 + 8x^9y$

- b. $a^4b^2c^3 - abc^8 + a^2b^3c^4$

2. Simplify and find the degree of the polynomial

$$5x^4y^2 - 6x^3y^3 + 8x^4y^2 - 4x^3y^3$$

Homework: pg. 330 #9,11,13,15,17,19,21,23,25,27,29,33,37,39,43,47,51,55,61

Multiplying Polynomials

Recall: $x^m * x^n = x^{m+n}$

Examples:

Multiply.

1. $7x * 8x$

2. $5x^6yz^7 * 12x^8z^6$

Examples:

Multiply the polynomial by the monomial.

1. $4x(7x^3 - 6x^2 + 5x - 8)$

2. $-3x^5(-2x^4 + x^3 - x^2 - 15x + 21)$

Examples:

Multiply the polynomial by the polynomial.

1. $(x + 11)(x + 9)$

2. $(5x - 2)(2x - 9)$

3. $(2x^2 + 4x - 3)(x + 6)$

4. If $f(x) = x + 8$ and $g(x) = 3x^2 + 6x - 2$ find $f(x) * g(x)$

5. $(2x + 7)(2x - 7)$

6. $(5x - 8)^2$

Homework: pg. 338 #5,7,9,13,15,21,23,25,31,35,37,41,53,59,61

Division of Polynomials

Examples:

1. $\frac{32x^9}{4x^4}$

2. $\frac{40x^3y^{11}}{8xy^2}$

3. $\frac{7x^2 - 21x - 49}{7}$

4. $\frac{48x^{10} + 12x^7 + 30x^5}{6x^2}$

Dividing a Polynomial by a Polynomial

Examples:

1. $\frac{x^2 - 10x + 16}{x - 2}$

2. $\frac{x^2 + 13x + 36}{x + 4}$

3. $\frac{x^2 - 3x - 8}{x + 7}$

4. $\frac{12x^2 - 7x + 4}{3x - 4}$

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

Homework: pg. 346 #5,7,15,17,19,21,27,31,35,37,41,43,45,51