8.1 Part 1 Polynomials

A monomial is a number, a variable, or the product of a number and one or more variables with whole number exponents.

Some examples...

y $\frac{1}{5}$ $-2m$

$a^2b^5c^3d$

The degree of a monomial is the add sum of the exponents of the variables.

EXAMPLES: State the degree of each monomial.

1. $-5x^4y^2$ degree=6
2. $\frac{2}{3}b^3$ degree=3
3. 12 degree=0
4. $7g^2h^1$ degree=3
5. -10 degree=0
6. $-9p^1$ degree=1

A polynomial is a monomial or a sum or monomials.

binomial- has 2 terms
trinomial- has 3 terms

Polynomials are usually written in standard form, which means that the terms are arranged in decreasing order of the exponents.

For example, $x^2 + 4x - 3$ is in decreasing (descending) order. Increasing (ascending) order would look like $-3 + 4x + x^2$.

high → low
low → high

EXAMPLES: Determine whether each expression is a polynomial.

1. $7x^2y^3 + 6xy - y^5$ → $7x^2y^3 + 6xy + -y^5$ ✓ ✓ ✓ ✓
polynomial

2. $\frac{2}{3}g^2 - 1$ → $\frac{2}{3}g^2 + -1$ ✓ ✓
polynomial

3. $\frac{-5}{h^3} + 14h$ ✗ ✓
quotient
not a polynomial

4. 7 ✓
polynomial

The degree of a polynomial is the greatest degree of its terms.

EXAMPLES: State the degree of each polynomial.

1. $6g^4n^3 + 7g^2n^9$ → degree = 11

deg = 7 deg = 11

2. $-8x^3 + 4x^2 - \frac{2}{3}x - 15$ → $-8x^3 + 4x^2 + -\frac{2}{3}x^1 + -15$

degree = 3

deg = 3 deg = 2 deg = 1 deg = 0

Identify the polynomial by degree and by the number of terms.

Polynomial	Degree	Identified by Degree	Identified by # of terms
6	0	constant	monomial
deg = 1 $3x + 1$ deg = 0	1	linear	binomial
deg = 2 deg = 0 $-x^2 + 2x - 5$ deg = 1	2	quadratic	trinomial
deg = 3 deg = 1 $4x^3 - 8x$	3	cubic	binomial

EXAMPLES: Arrange the terms of each polynomial so that the powers of x are in descending order.

high → low

1. $20x - 5x^3 - 7x^2 + 4x^4$

$4x^4 - 5x^3 - 7x^2 + 20x$

2. $24x^2y - 12x^3y^2 + 6x^4 - 9y^5x^0$

$6x^4 - 12x^3y^2 + 24x^2y - 9y^5$

EXAMPLES: Arrange the terms of each polynomial so that the powers of x are in ascending order.

low → high

1. $-12x^2 + 11x^5 - 18x - 6x^3 + 15x^0$

$15 - 18x - 12x^2 - 6x^3 + 11x^5$

2. $-8xy^4 + 9x^4y - 5x^3y^2 + x^5 - 6x^2y^6$

$-8xy^4 - 6x^2y^6 - 5x^3y^2 + 9x^4y + x^5$