

## Polynomials #1 Notes

A **monomial** is a number, a variable, or a product of numbers and variables.

Examples of monomials:

$$7 \quad w \quad xy \quad 15xy \quad 45x^2y^{15}$$

$$10 \quad 10x \quad 10xy^3 \quad x$$

\*\*\* Monomials are also called terms.

A **polynomial** is a monomial or sum of monomials (each monomial is a term).

Example:  $2x^2 + 4x + 3$

Polynomials in **standard form** are written so that the exponents of a variable decrease from left to right.

Example:  $3x^3 - 4x + 1$

Example:  $2x^2 + 4x + 3$

\*\*\*Note:  $5x - 2x^2 + 3$  is not in standard form.  $1 - 5x + 4x^4$  is also not in standard form.

The **leading coefficient** is the coefficient on the first term when the polynomial is written in standard form.

Example: In  $3x^3 - 4x + 1$ , the leading coefficient is 3.

Example: In  $5x^2 - x + 2$ , the leading coefficient is 5.

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

Example: In  $3x^3 - 4x + 1$ , the degrees of the terms are 3, 1, and 0 (respectively). So, the degree of the polynomial is 3.

Example: In  $5x^2 - x + 2$ , the degrees of the terms are 2, 1, and 0 (respectively). So, the degree of the polynomial is 2.

| Polynomial              | Terms                 | Degree of Each Term | Degree of Polynomial |
|-------------------------|-----------------------|---------------------|----------------------|
| $5mn^2$                 | $5mn^2$               | 3                   | 3                    |
| $-4x^2y^2 + 3x^2 + 5$   | $-4x^2y^2, 3x^2, 5$   | 4, 2, 0             | 4                    |
| $3a + 7ab - 2a^2b + 16$ | $3a, 7ab, -2a^2b, 16$ | 1, 2, 3, 0          | 3                    |

Example 1: Put in standard form, identify the degree and the leading coefficient of the polynomial

$$-4x + 3x^2 - 2 + 4x^3$$

Standard Form:  $4x^3 + 3x^2 - 4x - 2$

Degree: 3

Leading Coefficient: 4

Example 2: Put in standard form, identify the degree and the leading coefficient of the polynomial

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

Standard Form:  $2x^3 + 4x^2 - x + 5$

Degree: 3

Leading Coefficient: 2

Example 3: Put in standard form, identify the degree and the leading coefficient of the polynomial

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

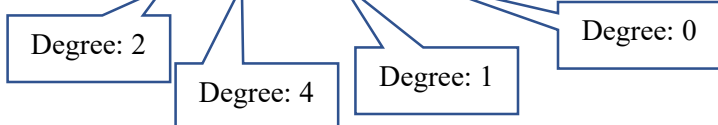
Standard Form:  $2x^7 - 5x^4 - x^2 + x + 3$

Degree: 7

Leading Coefficient: 2

Example 4: Put in standard form, identify the degree and the leading coefficient of the polynomial

$$m^2 - m^4 + m - 31$$



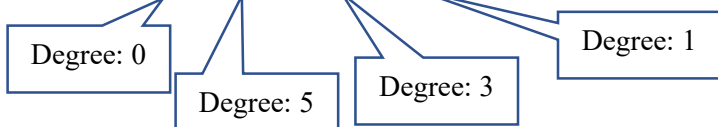
Standard Form:  $-m^4 + m^2 + m - 31$

Degree: 4

Leading Coefficient:  $-1$

Example 5: Put in standard form, identify the degree and the leading coefficient of the polynomial

$$-2 + 3h^5 - 8h^3 + h$$



Standard Form:  $3h^5 - 8h^3 + h - 2$

Degree: 5

Leading Coefficient: 3