8.1.1

Notes

An Introduction to Polynomials

Vocabulary

Monomial - one term

Ex: $5x^3$

Constant - a number (no variable)

Ex: 3 or -2

Polynomial - more than one term

Ex: $x^2 + 2x + 7 - 3x^4$

More Vocabulary

The monomials that make up a polynomial are called the <u>terms</u> of the polynomial.

In the polynomial $x^2 + 2x + x + 4$, the monomials $2x$ and x can be combined because they are <u>like terms</u>. The result is $x^2 + 3x + 4$.

The polynomial $x^2 + 3x + 4$ is a <u>trinomial</u> because it has 3 unlike terms.

A polynomial such as $5y^3 + y^2$ is a <u>binomial</u> because it has 2 unlike terms.

The <u>degree</u> of a polynomial is the degree of the monomial with the greatest degree. For example, the degree of $x^2 + 3x + 4$ is 2 and the degree of $5y^3 + y^2$ is 3.

Monomials

Not Monomials

X , 2

$2X^4$, $\sqrt{3}\,X$

$\dfrac{X}{3}$, $3X^2$

$\sqrt{X}$ → no variables under radicals

$\dfrac{1}{X}$ → no variables in denominators

X^{-2} → no negative exponents

↑
Monomials are just single term polynomials

Example 1: Which of the following are polynomials?
If it's a polynomial, state the degree.

a) $x^2 - 6x + 2x^3 + 3$

yes; deg = 3

b) $x^6 - 4x^3 - \dfrac{2}{x^3}$

No

c) $(2x-8)(x-4)^3$

$(2x-8)(x-4)(x-4)(x-4)$

$(2x-8)(x^3 + \bullet \, \text{-} \, \text{-} \, \bullet)$

$2x^4 + \text{-} \, \text{-} \, \text{-} \, \text{-}$

yes, deg = 4

d) $3 - \sqrt{x}$

No

Classifying Polynomials: We classify polynomials by the **number of terms** and the **degree**. Complete the chart below.

Polynomial Example	Degree	Name using Degree	Number of Terms	Name using Number of Terms
6	0	Constant	1	monomial
$x+3$	1	Linear	2	binomial
$3x^2$	2	Quadratic	1	monomial
$2x^3 - 5x^2 - 2x$	3	Cubic	3	trinomial
$x^4 + 3x^2$	4	Quartic	2	binomial
$-2x^5 + 3x^2 - x + 4$	5	Quintic	4	polynomial of 4 terms

More Vocabulary

Standard Form - A polynomial is written in **standard form** when

- the terms are arranged by degree in descending number order
- all coefficients are real numbers
- all exponents are non-negative integers

Using the example $7x^3 + x - 2x^5 + 3$

In *standard form* this would be written as $-2x^5 + 7x^3 + x + 3$

The **leading term** is $-2x^5$

The **leading coefficient** is -2

The **degree** is 5

Example 2: Write each polynomial in standard form and fill in the blanks below.

a. $\dfrac{12x^2 + 9x}{3} = 4x^2 + 3x$

Standard form: $4x^2 + 3x$

Leading term: $4x^2$

Leading coefficient: 4

Degree: 2

Classify by degree: Quadratic

Classify by number of terms: Binomial

b. $5x^2 - x^4 + 6x$

Standard form: $-x^4 + 5x^2 + 6x$

Leading term: $-x^4$

Leading coefficient: -1

Degree: 4

Classify by degree: Quartic

Classify by number of terms: Trinomial