Write and Classify Polynomials in Standard Form

Brenda Meery
Jen Kershaw

To access the online version of this FlexBook
click the link below:

https://flexbooks.ck12.org/user:c82fb0a2bc0f/cbook/basic-math-academic-bridge/section/9.2/primary/lesson/write-and-classify-polynomials-in-standard-form-msm8/

To access a customizable version of this book, as well as other interactive content, visit www.ck12.org

CK-12 Foundation is a non-profit organization with a mission to reduce the cost of textbook materials for the K-12 market both in the U.S. and worldwide. Using an open-source, collaborative, and web-based compilation model, CK-12 pioneers and promotes the creation and distribution of high-quality, adaptive online textbooks that can be mixed, modified and printed (i.e., the FlexBook® textbooks).

Printed: December 11, 2023 (PST)

AUTHORS
Brenda Meery
Jen Kershaw

9.2 Write and Classify Polynomials in Standard Form

Last Modified: Jan 06, 2023

[Figure 1]

Erin's Math class was learning how to measure the degree of a polynomial. The first one she is supposed to classify is $4x^3 + 3x + 9$. Can you identify it by degree? Is it in standard form?

In this concept, you will learn to write and classify polynomials in standard form.

Polynomials

A **polynomial** is an algebraic expression that shows the sum of monomials.

Here are some polynomials.

$$x^2 + 5 \qquad 3x - 8 + 4x^5 \qquad -7a^2 + 9b - 4b^3 + 6$$

An expression with a single term is a **monomial**, an expression with two terms is a **binomial**, and an expression with three terms is a **trinomial**. An expression with more than three terms is named simply by its number of terms.

First, let's think about how you can classify each polynomial. You classify them according to terms. Each term can be classified by its degree.

The **degree** of a term is determined by the exponent of the variable or the sum of the exponents of the variables in that term.

The expression x^2 has an exponent of 2, so it is a term to the second degree.

The expression $-2x^5$ has an exponent of 5, so it is a term to the fifth degree.

The expression x^2y has an exponent of 2 on the x and an unwritten exponent of 1 on the y, so this term is to the third degree $(2+1)$. Notice that you add the two degrees together because it has two variables.

The expression 8 is a monomial that is a constant with no variable, its degree is zero.

You can also work on the ways that you write polynomials. One way to write a polynomial is in **standard form**. In order to write any polynomial in standard form, **you** look at the degree of each term. You then write each term in order of degree, from highest to lowest, left to right.

Let's look at an example.

Write the expression $3x-8+4x^5$ in standard form.

First, look at the degrees for each term in the expression.

$3x$ has a degree of 1

8 has a degree of 0

$4x^5$ has a degree of 5

Next, write this trinomial in order by degree, highest to lowest

$4x^5+3x-8$

The answer is $4x^5+3x-8$.

The degree of a polynomial is the same as the degree of the highest term, so this expression is called a fifth degree trinomial.

Examples

Example 1

Earlier, you were given a problem about Erin and the polynomial.

Erin has to identify the degree of the polynomial $4x^3 + 3x + 9$.

First, look at the degrees for each term in the expression.

$4x^3$ has a degree of 3

$3x$ has a degree of 1

9 has a degree of 0

Next, the highest degree identifies the degree of the polynomial.

The term $4x^3$ is the highest degree so the degree of the polynomial is 3.

The answer is that the polynomial is of the third degree.

Example 2

Write the following polynomial in standard form.

$4x^3 + 3x^5 + 9x^4 - 2xy + 11$

First, look at the degrees for each term in the expression.

$4x^3$ has a degree of 3

$3x^5$ has a degree of 5

$9x^4$ has a degree of 4

$-2xy$ has a degree of 2

11 has a degree of 0

Next, write this polynomial in order by degree, highest to lowest

$3x^5 + 9x^4 + 4x^3 - 2xy + 11$

The answer is $3x^5 + 9x^4 + 4x^3 - 2xy + 11$.

Example 3

Name the degree of the expression $5x^4 + 3x^3 + 9x^2$.

First, look at the degrees for each term in the expression.

$5x^4$ has a degree of 4

$3x^3$ has a degree of 3

$9x^2$ has a degree of 2

Next, the highest degree identifies the degree of the polynomial.

The term $5x^4$ is the highest degree so the degree of the polynomial is 4.

The answer is that the polynomial is of the fourth degree.

Example 4

Name the degree of the expression $6y^3 + 3xy + 9$.

First, look at the degrees for each term in the expression.

$6y^3$ has a degree of 3

$3xy$ has a degree of 2

9 has a degree of 0

Next, the highest degree identifies the degree of the polynomial.

The term $6y^3$ is the highest degree so the degree of the polynomial is 3.

The answer is that the polynomial is of the third degree.

Example 5

Write the following polynomial in standard form and identify the degree of the polynomial.

$7x^2 + 3x - 2x^4 + 8x^6 - 7$

First, look at the degrees for each term in the expression.

$7x^2$ has a degree of 2

$3x$ has a degree of 1

$-2x^4$ has a degree of 4

$8x^6$ has a degree of 6

-7 has a degree of 0

Next, write this polynomial in order by degree, highest to lowest

$8x^6 - 2x^4 + 7x^2 + 3x - 7$

Then, the highest degree identifies the degree of the polynomial.

The term $8x^6$ is the highest degree so the degree of the polynomial is 6.

The answer is $8x^6 - 2x^4 + 7x^2 + 3x - 7$ and the polynomial is of the sixth degree.

Review

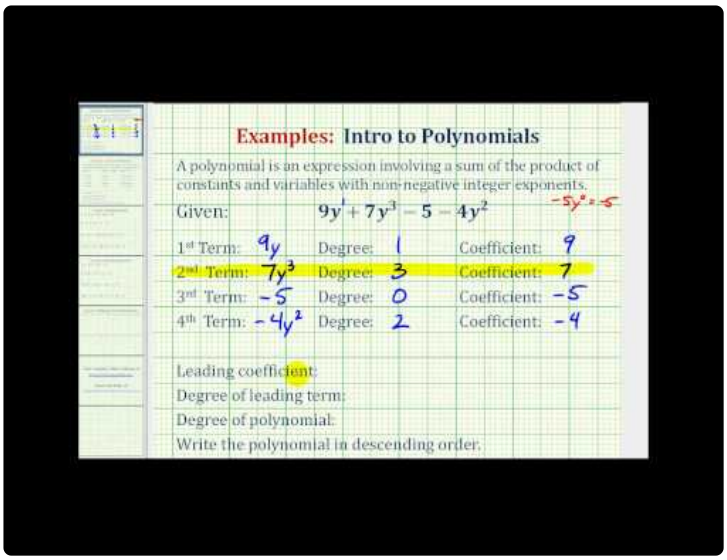
Write the following polynomials in standard form and then identify its degree:

1. $4x^2 + 5x^3 + x - 1$
2. $9 + 3y^2 - 2y$
3. $8 + 3y^3 + 8y + 9y^2$
4. $y + 6y^4 - 2y^3 + y^2$
5. $-16y^6 - 18$
6. $3x + 2x^2 + 9y + 8$
7. $8y^4 + y - 7y^3 - 3y^2$
8. $-3 + 8x^2 - 2x^3 - x$
9. $9 - 3y^2 - 2y^3 + 2y$
10. $14 + 6x^2 - 2x - 8y$
11. $4x + 3x^2 - 5x^3 + 8x^4$
12. $-8 + 3y^2 - 2y^3 + y$
13. $9 + 8y^2 + 2y^3 - 8y$
14. $m^4 - 12m^7 + 6m^5 - 6m - 8$
15. $-x^3y^2 + 5x^3y + 8xy$

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

Resources



https://flexbooks.ck12.org/flx/render/embeddedobject/153353

Report Content Errors

1.0 REFERENCES

Image	Attributions
	**Credit:** DALL-E/CK-12 Foundation - Larame Spence **Source:** CK-12 Foundation **License:** CK-12 Curriculum Materials License