



# Introduction to Polynomials

Adding and Subtracting

# What is a Polynomial?

- A polynomial is one term or the sum or difference of two or more terms.
- Examples of polynomials are:

$$5xy^2$$

$$3x^2 + 3x - 9$$

$$12a - 14$$

# Classifying by Degree

- We classify polynomials by degrees or by number of terms.
- Degree of a term is the exponent of the term.
$$x^4 + 2x^2 - 4$$
- In this case it is 4.
- Polynomials with degrees of 0 – 3 have special names. They are:
  - ◆ 0 degree – **constant**
  - ◆ 1<sup>st</sup> degree – **linear**
  - ◆ 2<sup>nd</sup> degree – **quadratic**
  - ◆ 3<sup>rd</sup> degree - **cubic**

# Classifying By Number of Terms

- Polynomials can also be named by the number of terms that make it up.
  - ◆ One term ( $6xy$ ) – **Monomial**
  - ◆ Two terms ( $4x - 9$ ) – **Binomial**
  - ◆ Three terms ( $5d^2 + 5d - 10$ ) – **Trinomial**
- Three or more terms is considered a polynomial

# Classify each polynomial by its degree and number of terms.

1.  $2x^2$

2.  $4b^3 - 3b + 8$

3.  $-2t^4 + 5t$

4.  $5$

1. Quadratic monomial

2. Cubic trinomial

3. 4<sup>th</sup> degree binomial

4. 0 degree constant

# Simplifying Polynomials

Simplify the following (answers on next page)

1.  $5x^2 + 12x^2$

2.  $2w^3 - 4w + 3w^3$

3.  $-3r^3 + 5r^3 - 8r^3$

4.  $14x - 9$



Combine like  
terms

# Simplifying Polynomials

Simplify the following (answers on next page)

1.  $5x^2 + 12x^2 = 17x^2$

2.  $2w^3 - 4w + 3w^3 = 5w^3 - 4w$

3.  $-3r^3 + 5r^3 - 8r^3 = -6r^3$

4.  $14x - 9 = 14x - 9$  (already simplified)

# Adding Polynomials

- Combine like terms
- Order exponents from greatest to least

$$\begin{array}{ccccccc} \underline{3x^3} & - & \underline{4x^2} & + & \underline{5x} & + & (4x^4 - \underline{4x^3} - \underline{3x^2} - \underline{2x}) \\ & & \underline{\underline{4x^2}} & & \underline{\underline{5x}} & & \underline{\underline{4x^4}} & - & \underline{\underline{4x^3}} & - & \underline{\underline{3x^2}} & - & \underline{\underline{2x}} \end{array}$$

$$= 4x^4 + \underline{\underline{3x^3 - 4x^3}} - \underline{\underline{4x^2 - 3x^2}} + \underline{\underline{5x - 2x}}$$

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

# Adding – Try on your own

- Try these. The answers are on the next slide.
  - Remember to combine like terms and to put the exponents in the proper order.
1.  $(4x^2 - 3x^3 + 3) + (2x^2 - 2x^3 - 3)$
  2.  $(15x^4 - 4x^2 - 1) + (4x^4 + 3x^3 + 2x^2 - 2)$

# Try on your own – Answers

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

- The exponents are in the proper order
- Remember that  $-3 + -2$  is  $-5$

2.  $(15x^4 - 4x^2 - 1) + (4x^4 + 3x^3 + 2x^2 - 2) =$   
 $19x^4 + 3x^3 - 2x^2 - 3$

- There's only one term with an exponent of 3
- $-4 + 2 = -2$

# Subtracting Polynomials

- If you can add, you can subtract!
- Like terms still need to be combined

$$(6x^3 - 2x^2 - x) - (5x^3 - 4x^2 + 5x)$$

1. First, put a 1 in front of the ( )
2. Then you'll use the distributive property
3. Finally, like terms can be combined

# Subtracting Polynomials (cont.)

$$(6x^3 - 2x^2 - x) - (5x^3 - 4x^2 + 5x)$$

$$= (6x^3 - 2x^2 - x) - 1(5x^3 - 4x^2 + 5x)$$


Distributive  
Property!

- ◆ Here, -1 is multiplied by every term

- ◆ So,  $-1(5)$  and  $-1(-4)$  and  $-1(5)$

$$= 6x^3 - 2x^2 - x - 5x^3 + 4x^2 - 5x$$

$$= x^3 + 2x^2 - 6x$$

# Subtracting – Try on your own

- Put a 1 in front of the ( ) that is being subtracted.
  - Use the distributive property
1.  $(4x^5 - 3x^4 - x + 4) - (3x^5 - 2x - 2)$
  2.  $(10z^3 - 2z^2) - (4z^3 - 6z^2)$

# Try on your own – Answers

$$\begin{aligned} 1. \quad & (4x^5 - 3x^4 - x + 4) - (3x^5 - 2x - 2) \\ &= (4x^5 - 3x^4 - x + 4) - 1(3x^5 - 2x - 2) \\ &= 4x^5 - 3x^4 - x + 4 - 3x^5 + 2x + 2 \\ &= x^5 - 3x^4 + x + 6 \end{aligned}$$

$$\begin{aligned} 2. \quad & (10z^3 - 2z^2) - (4z^3 - 6z^2) \\ &= (10z^3 - 2z^2) - 1(4z^3 - 6z^2) \\ &= 10z^3 - 2z^2 - 4z^3 + 6z^2 \\ &= 14z^3 + 4z^2 \end{aligned}$$

# Summary

- Polynomials can be classified by degree (constant, linear, quadratic or cubic) or number of terms (monomial, binomial and trinomial).
- Terms can only be added or subtracted if they have the exact same variable (combining like terms)
- For more “lessons”/help, see the [websites I have on my portal](#)