

Addition & Subtraction of Polynomials

I. A. **Monomial** - is an algebraic expression consisting of **one term** that is a **constant** (a number), a **variable**, or the **product of constants and variables**.

****Remember monomials are terms whose exponents are whole numbers. The exponents may NOT be fractions, decimals or negative numbers. A monomial can NOT have a variable in the denominator.**

Ex's: **Monomials**: $-4, p, 5m^3, -2ab^3c, 2n, x^3, 4a^4b^3, 7$ **NOT monomials**: $p^{2.4}, 2^x, \sqrt{x}, \frac{5}{g^2}, \frac{4}{3x}, -3x^{-4}$

B. **Polynomial** - The sum or difference of monomials.

# of terms	1	2	3	4 or more
Name	Monomial	Binomial	Trinomial	Polynomial
Examples	$3x^2$	$4x - 3$	$7x^2 + 5x - 6$	$8x^4 + 3x^2 + 6x + 2$

II. **Like terms** - Monomials that have the **same variables** having the **same exponents**.

Ex's: $4x^2$ & $6x^2, 5x$ & $2x, 7xy^2$ & $6xy^2$. **NOT like terms**: 5 & $3x, 3x^2$ & $4x^3$.

***Only like terms may be combined by addition or subtraction.**

III. **Descending Power Order** - When a polynomial is written from its **highest exponent** to its **lowest exponent** ex: $2x^3 - x^2 + 4x + 4$

****This is also known as standard form.** → When there is only 1 type of variable

Ex's Write the following in **descending power order**:

a) $4x^5 + 6x^{10} - 2x^3 + x^4$
 $(6x^{10} + 4x^5 + x^4 - 2x^3)$
 L.C.

b) $7x^3 + 6x^4 + 7x^2 - 10x^8$
 $(-10x^8 + 6x^4 + 7x^3 + 7x^2)$
 L.C.

IV. **Leading Coefficient** - When a polynomial is in **descending power order** the **leading coefficient** is the **coefficient of the first term**.

→ **aka**: coefficient of the term with the highest exponent

Ex's What are the leading coefficients of the following:

a) $6x^2 + 8x^3 - 4x^8$
 $-4x^8 + 8x^3 + 6x^2$
 $(L.C. = -4)$

b) $7x^4 - 3x^5$
 $-3x^5 + 7x^4$
 $(L.C. = -3)$

v. **Simplest Form** - When the polynomial contains **NO like terms** ex: $4x^2 - 2x + 5$

- ata standard form
- Combine the like terms 1st
 - put the answer in descending power order (DPO)

VI. Degree-

A) **Monomial**: The degree is the ^{add} sum of the exponents of the different variables (Add exponents)
ex: $2x^3y^4z^5$ is $3 + 4 + 5 = 12$

Ex's: What is the degree of:

a) $4a^2bc^3d^5e^7$

$2+1+3+5+7 = 18$

b) $7x^5$

5

c) y

1

d) 5

0

$5x^0$
 $5 \cdot 1$
 5

B) **Binomial or Trinomial**: The degree is the highest degree of any of its terms (highest exponent)

Ex's: What is the degree of:

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

3

b) $6x^5 + 4x^3$

5

VII. Addition of Polynomials- Remember you can only add like terms!

Steps: 1) Write like terms under one another

2) Add like terms (keep the exponents the same)

3) Make sure your answer is in descending power order

VIII. **Subtracting Polynomials**- Remember you can only subtract like terms

Steps: 1) Write like terms under one another and place the 2nd polynomial in parentheses

2) Distribute the negative sign to the 2nd polynomial

3) Add like terms (keep the exponents the same)

4) Make sure your answer is in descending power order

IX. Practice

1) Which of the following expressions cannot be simplified?

a) $3x + 6x$

b) $6y - 3y$

c) $3x + 6y$

d) $2x^2 + 7x^2$

2) Add: $3x^2 - 6x$
 $+ 1x^2 + 2x$

$4x^2 - 4x$

3) Add: $7x^2 + 3x - 5$
 $+ -4x^2 - 1x + 4$

$3x^2 + 2x - 1$

4) Add: $4a^2 + 2ab + 3b^2$
 $+ -a^2 - 3ab + b^2$

$3a^2 - ab + 4b^2$

5) $(x^2 + 2x) + (4x^2 + 7)$

$5x^2 + 2x + 7$

or $\begin{array}{r} x^2 + 2x \\ + 4x^2 \\ \hline 5x^2 + 2x + 7 \end{array}$

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

$5x^2 + x - 2$

or $\begin{array}{r} 5x^2 - 3x + 3 \\ + 4x - 5 \\ \hline 5x^2 + x - 2 \end{array}$

7) Which of the following represents the sum of $(3x^2 - 3x + 8)$ and $(-5x^2 + 4x + 2)$

a) $-8x^2 - x + 10$

c) $2x^2 - x + 10$

$-2x^2 + x + 10$

or $\begin{array}{r} 3x^2 - 3x + 8 \\ + (-5x^2 + 4x + 2) \\ \hline -2x^2 + x + 10 \end{array}$

b) $-2x^2 + x + 10$

d) $8x^2 - 7x + 6$

Distribute the negative $-2x^2 + x + 10$

8) From $(7x^2 + 8x - 3)$ subtract $(4x^2 - 5x + 6)$

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

c) $11x^2 + 13x + 3$

$7x^2 + 8x - 3 - 4x^2 + 5x - 6$

$(7x^2 + 8x - 3)$

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

d) $3x^2 + 13x - 9$

$3x^2 + 13x - 9$

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

$3x^2 + 13x - 9$

9) When $(4x^2 - 8x - 3)$ is subtracted from $(x^2 - 2x + 1)$ the result is

a) $-3x^2 + 6x + 4$

c) $5x^2 + 6x + 4$

$(x^2 - 2x + 1) - (4x^2 - 8x - 3)$
 $x^2 - 2x + 1 - 4x^2 + 8x + 3$
 $-3x^2 + 6x + 4$

$(x^2 - 2x + 1)$
 $+ (-4x^2 + 8x + 3)$
 $-3x^2 + 6x + 4$

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

d) $-3x^2 - 6x - 2$

10) $5x^2 + 8x - (3x^2 - 2x)$

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

$2x^2 + 10x$

or $\begin{array}{r} 5x^2 + 8x \\ + (-3x^2 + 2x) \\ \hline 2x^2 + 10x \end{array}$

11) From $4x^2 + 3x - 3$ subtract $x^2 - 3$

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

$3x^2 + 3x$

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

12) $(2x^2 + 2x) - (8x + 7)$

$2x^2 + 2x - 8x - 7$

$2x^2 - 6x - 7$

$(2x^2 + 2x)$

$+ (-8x - 7)$

$2x^2 - 6x - 7$

13) How much less than $5x^2 - 3x + 2$ is $2x^2 + 5$?

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

$3x^2 - 3x - 3$

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

**Challenge: 14) $4x^2 - (6x - (3x - 2x^2) + 4)$

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

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

$2x^2 - 3x - 4$

1



6

