9-4 Polynomials
9-5 Adding and Subtracting Polynomials

Make sure you have the definitions of the following words in your notes:
term, constant, polynomial, monomial, binomial, trinomial, coefficient, degree, and degree of the polynomial.

Examples of terms:

8	-12h	xy^4	$9a^2bc^8$	$\frac{1}{2}x^5$

Examples of constants:

17	-13	¾	0.26	1.745

A polynomial is the sum (or difference) of terms. If there is one, two, or three terms, the polynomial has a more specific name. Refer to the chart below.

Type	Examples:	
Monomial	$7b^3c^2d^{11}$	18w
Binomial	2x + 3	a – 7b
Trinomial	$8x^2 – 17x + 3$	$9a^2bc^8 + \frac{1}{4}x – 10y$
Polynomial	5x + 2y – 7z + 10	$7x^4 + 2x^3 – x^2 – 4x + 1$

The degree of a term is the number of times the variable appears.

The degree of $15x^3$ is $\boxed{3}$ because if you write it out in expanded form it looks like $15 \bullet x \bullet x \bullet x$. Notice the variable appears 3 times.

The degree of $–2x^2y^5$ is $\boxed{7}$ because in expanded form it is $-2 \bullet x \bullet x \bullet y \bullet y \bullet y \bullet y \bullet y$.
If you didn't want to write it out in expanded form every time, notice you are just adding the exponents together.

The degree of 28 is $\boxed{0}$ because there are no variables. Since 28 is a constant, the degree of any constant is zero.

To get the degree of a polynomial, get the degree of each term. The highest degree is the degree of the polynomial.

What is the degree of $-22x – 9x^5y^2z^3 + \frac{1}{2}x^7 + xy^{10} – 100$

First find the degree of each term.

Term	Degree	Reason
–22x	1	there is one x or x is raised to the first power
$–9x^5y^2z^3$	10	5 + 2 + 3
$\frac{1}{2}x^7$	7	x is to the seventh
xy^{10}	11	1 + 10 (remember x is to the first power)
–100	0	-100 is a constant

The highest of all those degrees is 11, so the degree of $-22x – 9x^5y^2z^3 + \frac{1}{2}x^7 + xy^{10} – 100$ is $\boxed{11}$.

A) Simplify B) Name the polynomial C) State the degree

1) $(8x^2 - 3x + 1) + (2x^2 + 5x - 11)$

$8x^2 - 3x + 1$
$(+)\ 2x^2 + 5x - 11$
$10x^2 + 2x - 10$

Line up your terms so that there is a column for each like term. Only put like terms in that column.
Combine like terms (Remember when adding/subtracting like terms, add/subtr. the coefficients & tack on the same variable part)

A)	$10x^2 + 2x - 10$
B)	Trinomial
C)	2

because there are 3 terms
The degrees of the 3 terms are 2, 1, 0 and 2 is the highest

2) $(4x^4y^7 + 7x^2y^8 - 5x + 7) - (4x^4y^7 + 3x^2y^8 - 5x - 7)$

$4x^4y^7 + 7x^2y^8 - 5x + 7$
$(-)\ 4x^4y^7 + 3x^2y^8 - 5x - 7$

Notice we are not adding. However, it's very easy to change to addition. All you have to do is the subtraction rule. (You MUST do this!!!)

$4x^4y^7 + 7x^2y^8 - 5x + 7$
$(+)\ -4x^4y^7 - 3x^2y^8 + 5x + 7$
$4x^2y^8 + 14$

Leave the top polynomial alone.
Switch the minus to plus and then change every sign to its opposite.
Combine each column of like terms.

A)	$4x^2y^8 + 14$
B)	Binomial
C)	10

because there are 2 terms
The degrees of the 2 terms are 10 (2 + 8) and 0. 10 is the highest

Polynomials are usually written in either ascending or descending order. That means that exponents either increase or decrease.

Write the polynomials in descending order according to x.

3) $12x^7 + 2x^{10} - x^3 - 21 + 6x^2$

The highest exponent according to x is 10. So the $2x^{10}$ term will go first. The next highest is $12x^7$. Then $-x^3$, then $6x^2$ and lastly -21.

* Remember the signs of the terms have to go with the term when it moves.

The final answer is $\boxed{2x^{10} + 12x^7 - x^3 + 6x^2 - 21}$ (Notice the degree of x decreases: 10, 7, 3, 2, 0)

4) $7x^8y + 4x^4y^7 - x^9y^4 + 8xy^3$

The highest exponent **<u>according to x</u>** is 9. So the $-x^9y^4$ term will go first. The next highest is $7x^8y$. Then $4x^4y^7$ and lastly $8xy^3$.

* Remember the signs of the terms have to go with the term when it moves.

The final answer is $\boxed{-x^9y^4 + 7x^8y + 4x^4y^7 + 8xy^3}$ (Notice the degree of x decreases: 9, 8, 4, 1)

(If we wanted to write it descending according to y, it would have been $\boxed{4x^4y^7 - x^9y^4 + 8xy^3 + 7x^8y}$)

Homework: p. 517 #29-32 and p. 525 #22-36 Even. Follow directions from the notes (A, B, C).