Unit 4 - Polynomials - Algebra Review Sheet

Important Vocabulary

Term – A number, variable or product of numbers and variables
Like/similar terms – Two or more terms that have the same variable(s) with the same exponents
Unlike terms – Two or more terms with different variables
Monomial – A single variable or number, or a product of a coefficient and one or more variables with exponents that are whole numbers
Binomial – A polynomial with two terms
Trinomial – A polynomial with three terms
Simplest form – When a polynomial contains no like terms
Standard form – When a polynomial is written with the exponents in descending order
Coefficient – The number in front of the variable
Leading coefficient – The number in front of the variable with the highest degree
Constant – A number that is not attached to any variable
Variable – A letter or symbol used to replace a number
Degree of a monomial – the sum of the exponents of its variables
Degree of a polynomial – the degree of the monomial with the greatest exponent

Laws of Exponents

- Anything to the FIRST power is ITSELF
  $20^1 = 20$
- Anything to the ZERO power is ONE
  $20^0 = 1$
- When MULTIPLYING exponents that have the same base, ADD the powers
  $5^2 \bullet 5^4 = 5^6$
- When DIVIDING exponents that have the same base, SUBTRACT the powers
  $7^{10} \div 7^8 = 7^2$
- When raising an exponent to another power, MULTIPLY the powers.
  $(3^2)^4 = 3^8$

Polynomial

An expression made up of variables and constants.
The exponents are always WHOLE NUMBERS.

Adding/Subtracting Polynomials

1. Distribute
2. Combine like terms
3. Write your answer in standard form

Tips:

- Powers NEVER change
- Write in coefficients of 1
  EX: $2x + x = 2x + 1x = 3x$, not $2x$
- Be careful when distributing a negative
  EX: $(3x + 1) - (2x - 4) = 3x + 1 - 2x + 4$
- Subtract x from y looks like $y - x$
- SUM or TOTAL means ADD
- DIFFERENCE means SUBTRACT
- PERIMETER means add up ALL of the sides

Multiplying Polynomials

1. Write in exponents and coefficients of 1
2. Distribute (if necessary)
3. Multiply coefficients
4. Multiply variables by ADDING powers
   (or if power to a power MULTIPLY)

Tips:

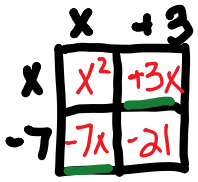
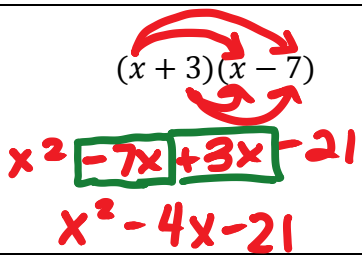
- Use the LAWS OF EXPONENTS
- Powers ALMOST ALWAYS change
- PRODUCT means MULTIPLY
- Be careful of integers
- Pay attention to what type of polynomials you start with (never end up with more terms than your largest polynomial)
  EX: $(4x^4y^3z^3)(2x^2y^2z) = 8x^6y^5z^4$
  (mono*mono = mono)

Adding versus Multiplying

Simplify: $3x^2 + 5x^2$	Simplify: $3x^2 \bullet 5x^2$
$= 8x^2$	$= 15x^4$
Add coefficients	Multiply coefficients
Powers don't change	Add powers

Double Distributing

- You can use whatever method works best for you!

Box method	Arrows	Write out FOIL
$(x+3)(x-7)$  $x^2-4x-21$	$(x+3)(x-7)$  $x^2-4x-21$	$(x+3)(x-7)$ F: $x\cdot x=x^2$ O: $x\cdot -7=-7x$ I: $3\cdot x=3x$ L: $3\cdot -7=-21$ $-4x$ $x^2-4x-21$

- Know how to do problems like: $(x+2)(x^2-3x+1)$
- Be careful to expand out problems with exponents! EX: $(x+1)^2$ is really $(x+1)(x+1)$

Dividing Polynomials

1. Write in exponents and coefficients of 1
2. Divide coefficients
3. Divide variables by SUBTRACTING powers

Tips:

- Use the LAWS OF EXPONENTS
- Powers ALMOST ALWAYS change
- QUOTIENT means DIVIDE
- Be careful of integers
- Pay attention to what type of polynomials you start with (never end up with less terms than your largest polynomial) EX: $\frac{10x^2+5x}{5x}=2x+1$ NOT $2x$!!

Closure

A set is CLOSED under an operation if it produces a member of that same set. Polynomials are closed under addition, subtraction, multiplication but NOT division.

EXAMPLES:

Addition: $3x^2+8x^2=11x^2$

Subtraction: $3x^2-8x^2=-5x^2$

Multiplication: $3x^2 \bullet 8x^2=24x^4$

NON-EXAMPLE:

Division: $\frac{10x^3}{5x^8}=2x^{-5}$ ***NOT a polynomial

Factoring!

- Remember: we always RE-WRITE and NEVER change the value of an expression

STEPS

1. Factor out a GCF
   - ➔ Common coefficient AND variable
2. Factor remaining trinomial
   - ➔ Use Sum-Product table
   - ➔ Factor by grouping
   - ➔ Difference of two perfect squares
3. Repeat step 2 if necessary for as many times as you need

EXAMPLES:

Factor.

1. x^4-81

$(x^2+9)(x^2-9)$

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

2. x^4+7x^2+10

S|P

7|10

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

3. $2m^3-26m^2+72m$

$2m(m^2-13m+36)$

$2m(m-9)(m-4)$

S|P

-13|36

4. $18a^2-33a+9$

$3(6a^2-11a+3)$

$3(6a^2-9a-2a+3)$

$3(3a(2a-3)-1(2a-3))$

$3(2a-3)(3a-1)$

*** Always check by multiplying back through to make sure you get what you started with ☺ ***