Unit 1 – Polynomial and Rational Expressions

2.1: Adding and Subtracting Polynomials (so easy it's ridiculous)

Learning Goal: We are learning how to add (subtract) polynomial expressions

Definition 2.1.1

A **SINGLE VARIABLE POLYNOMIAL** is a mathematical expression constructed by combining (through addition/subtraction) **POWER FUNCTIONS**. The polynomial is (usually) written in decreasing **order** (**degree**) of the power functions (and no "power" has more than one "term"). **MULTIVARIABLE POLYNOMIALS** also exist, but for ***FUNCTIONS 11 we will only consider polynomials with a single variable***.

Definition 2.1.2

A **POWER FUNCTION** is of the form $y = c \cdot x^n$ where "n" is the power, and "c" is a **real number** called the coefficient.

e.g. of power Functions (with their orders):

$y = -5x^6$ order 6 $\quad y = \pi x^3$ order 3 $\quad y = 7x^0$ order 0 $\quad = 1$

e.g.'s of Polynomial Expressions (with their orders):

single variable: $7x^3 - 5x^4 + 3x^2 - 2x + 1$ (orders 3, 4, 2, 1, 0)

multivariable: $-3x^2y^1 + 5xy^2 - 8xy^1z^3$ (Order 3, Order 3, Order 5)

One word that requires a closer look: **TERM**

Definition 2.1.3

In any expression a **TERM** is **CONSTRUCTED BY MULTIPLYING FACTORS TOGETHER**. Terms are separated from each other by addition and subtraction. Polynomials contain "many terms" (in fact "polynomial" literally means "many terms".) **THE TERMS OF A POLYNOMIAL EXPRESSION ARE ALL POWER FUNCTIONS. (We will look at this again!)**

Two power functions are called "**like terms**" if they have the **same order/degree/power** (but they certainly can have different coefficients!).

e.g.: $5x^3 - 8x^2 + 3x^3 + 4x$ (like terms)

$-3x^2y^3$, $4x^3y^2$, $8y^3x^2$

$7x^2y^3$ like

$2 \cdot 3 = 3 \cdot 2 \Rightarrow x^2y^3 = y^3x^2$

When simplifying and adding/subtracting polynomial expressions we combine like terms by adding/subtracting the coefficients of the like terms.

Example 2.1.1

a) Simplify: $(4x^2 - 5x^3 - 5) + (2x^3 - 4x + 2)$

drop the brackets $= 4x^2 - 5x^3 - 5 + 2x^3 - 4x + 2$

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

b) Subtract $4x^2 - 3x + 1$ from $6x^2 + x$

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

$= 6x^2 + x - 4x^2 + 3x - 1 = 2x^2 + 4x - 1$

Final Note: Polynomial Expressions (or functions too) are considered **equivalent** if they contain **exactly the same terms**. So, you can tell if two expressions are equivalent just by looking at them to see if they contain the same terms…OR we can tell that two mathematical objects are equivalent if they have no difference (eg. The mathematical objects a and b are equivalent if $a - b = 0$)

$0.\dot{9} = 1$

$1 - 0.\dot{9} = 0$

Success Criteria:

- I can determine the sum (difference) of two polynomials by adding (subtracting) their coefficients on terms with like orders
- I can determine whether two polynomial expressions are equivalent by graphing, or by simplifying them into the same expression.

Class/Homework (Section 2.1 in text)

1) Read Example 3 on page 87 for another view on **equivalence**
2) Pg 88 – 89 #4bdf, 5 – 7, 10 – 11
3) For the adventurous: Pg. 90 # 15, 16 (especially 16!)