

## Functions – Polynomials

Another way to make new functions is to combine basic functions.

The most common of these is a polynomial. It is made by adding or subtracting power functions.

$$\text{Ex: } f(x) = 3x^4 - 5x^2 + 7$$

A polynomial is made up of individual terms (terms can ONLY be power functions)

A polynomial with one term = monomial, two terms = binomial, three terms = trinomial

The degree of a term is its exponent  $3x^4 \rightarrow \text{degree } 4$ ,  $5x^2 \rightarrow \text{degree } 2$ ,  $7 \rightarrow \text{degree } 0$

The degree of the polynomial is the largest degree of any term.

The function,  $f(x) = 3x^4 - 25 + 7$ , is a trinomial of degree 4.

Technically, polynomials don't have to be functions with only one variable.

Terms can be made up of products of power functions of any number of variables.

Ex:  $3xy^4 - 5x^5z^2 - xyz$  The degree of a term is the sum of the exponents in that term.

$3xy^4 \rightarrow \text{degree} = 1 + 4 = 5$ ,  $5x^5z^2 \rightarrow \text{degree} = 5 + 2 = 7$ ,  $xyz \rightarrow \text{degree} = 1 + 1 + 1 = 3$

$3xy^4 - 5x^5z^2 - xyz$  is a trinomial of degree 7

## Operations with Polynomials

Adding (Subtracting) Polynomials: Add (Subtract) LIKE TERMS.

$$\text{EX. } (2x^4 + 3x^2 + 6) + (x^3 - 6x^2 + x - 9) = 2x^4 + x^3 + (3x^2 - 6x^2) + x + (6 - 9)$$

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

$$\text{EX. } (x^2 + 2x - 5) - (3x^2 - 2x - 6) = x^2 + 2x - 5 - 3x^2 + 2x + 6$$

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

Multiplying Polynomials: For 2 binomials – F.O.I.L.

$$\text{Ex. } (x + 6)(2x - 4) = x \cdot 2x + -4 \cdot x + 6 \cdot 2x + 6(-4) = 2x^2 - 4x + 12x - 24 = 2x^2 + 8x - 24$$

For other sized polynomials, multiply each term in the first polynomial by every term in the second polynomial.

$$\text{Ex. } (2x^2 + 3x - 5) \cdot (x - 3) = 2x^2(x - 3) + 3x(x - 3) - 5(x - 3) =$$

$$= 2x^3 - 6x^2 + 3x^2 - 9x - 5x + 15 = 2x^3 - 3x^2 - 14x + 15$$

Dividing Polynomials: Not yet