

POLYNOMIALS

Monomial in one variable: ax^n

a = constant = coefficient

x = variable

n = non-negative integer = degree

Ex: $2x^4$, $3x^2$, $2x^2$

like terms: same variable
same exponent

Polynomial in one variable

$$a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

$a_n, a_{n-1}, \dots, a_1, a_0$ = constants = coefficients

x = variable

n = non-negative integer = degree

a_n = leading coefficient

Q: 9

$$\underbrace{-2x^3}_{\text{leading term}} + \sqrt{2}x^2 - \frac{3}{2}x + 4$$

$4x^0$

Polynomial?

Degree

No

$n=3$

$$2x^3 + \left(\frac{3}{x^2}\right) + 2x + 3$$

$3x^{-2}$

No.

$$3x^2 + (2\sqrt{x}) + 4$$

$2x^{1/2}$

No

		Polynomial?	Degree
$x+4$	(binomial)	Yes	1
x^2-9	(binomial)	Yes	2
$4 = 4x^0$	(monomial)	Yes	0
0	Zero Polynomial	Yes	NO DEGREE

Addition and Subtraction of Polynomials

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

combine "like terms"

$$= 2x^3 + 4x^2 - 7x + 7$$

$$\begin{array}{r} 2x^3 + 3x^2 - 5x + 4 \\ + x^2 - 2x + 3 \\ \hline 2x^3 + 4x^2 - 7x + 7 \end{array}$$

Multiplication of Polynomials

Ex: $3x^2 \cdot 2x^5 = 6x^7$

Ex: $(x+4)(3x^2-x+2) =$

$$= 3x^3 - x^2 + 2x + 12x^2 - 4x + 8 =$$

$$= 3x^3 + 11x^2 - 2x + 8$$

$$\begin{array}{r} 3x^2 - x + 2 \\ + x + 4 \\ \hline 3x^3 + 2x^2 - 4x + 8 \\ 3x^3 - x^2 + 2x \\ \hline 3x^3 + 11x^2 - 2x + 8 \end{array}$$

SPECIAL PRODUCTS

$$1) (x+a)(x-a) = x^2 - ax + ax - a^2 = x^2 - a^2$$

$$(x+a)(x-a) = x^2 - a^2$$

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

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

$$2) (x+a)^2 = (x+a)(x+a) = x^2 + ax + ax + a^2 = x^2 + 2ax + a^2$$

$$(x+a)^2 = x^2 + 2ax + a^2$$

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

$$(x-a)^2 = x^2 - 2ax + a^2$$

$$\text{EX: } (2-3x)^2 = 4 - 12x + 9x^2$$

$$3) (x+a)^3 = (x+a)(x+a)(x+a) \\ (x^2 + 2ax + a^2)(x+a)$$

$$(x+a)^3 = x^3 + 3ax^2 + 3a^2x + a^3$$

$$(x+2)^3 = x^3 + 3 \cdot 2x^2 + 3 \cdot 2^2 \cdot x + 2^3 \\ = x^3 + 6x^2 + 12x + 8$$

$$(x-a)^3 = x^3 - 3ax^2 + 3a^2x - a^3$$

POLYNOMIALS IN MORE THAN ONE VARIABLE

Monomial $ax^m y^n$ ex: $3x^2 y^3$

degree = sum of the exponents of the variables

Polynomial

the sum or difference of two or more monomials

Degree = highest degree of all the terms

ex: $3x^2 y^3 + 4xy^2$ degree = 5