0.5 Operations with Algebraic Expressions 1

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تعابير جبرية

Polynomial : كثير الحدود

(Poly)

Poly of degree n has this form

$$a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \cdots + a_2 x^2 + a_1 x^1 + a_0 x^0$$

- $a_0, a_1, a_2, \cdots, a_n$ coefficients معاملات

  a_n ← معامل أعلى درجة

  a_0 ← الحد الثابت — Constant

  $a_n \neq 0$ — leading coefficients

- n degree of poly أعلى قوة

Exp $7x^6 - 4x^2 + 5$

① Degree $\Rightarrow n = 6$

② leading coefficient $a_6 = 7$

③ constant $\Rightarrow a_0 = 5$

$7x^6 + 0x^5 + 0x^4 + 0x^3 + 0x^2 + 0x + 5$

④ all coefficients $a_6 x^6 + a_5 x^5 + a_4 x^4 + a_3 x^3 + a_2 x^2 + a_1 x + a_0$ (7, 5)

$a_5 = 0$, $a_4 = 0$, $a_3 = 0$, $a_2 = -4$, $a_0 = 0$

⑤ Is this poly of one variable / two variables ...?

Exp $10x^1y^2 - 5x + 3y - 7$

① $n = 3$ degree

③ constant $a_0 = -7$

⑤ two variables (several variables)

Exp $\frac{1}{2} \cdot x^3 y^2$ (+0)

① $n = 2 + 3 = 5$

③ constant term $a_0 = 0$

⑤ several variables

Exp $-\sqrt{3}$

① $n = 0$ since $-\sqrt{3} = -\sqrt{3}\,x^0$

② leading coefficient $a_0 = -\sqrt{3}$

③ Constant term $= a_0 = -\sqrt{3}$

⑤ Poly with no variable (Constant)

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Exp $-x + 1 - 5x^3 + \frac{1}{2}x^5$

(معامل) (أس)

① $n = 5$

② $a_5 = \frac{1}{2}$

③ $a_0 = 1$

④ $a_5x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$

$a_5 = \frac{1}{2}$, $a_4 = 0$, $a_3 = -5$, $a_2 = 0$, $a_1 = -1$, $a_0 = 1$

⑤ one variable.

Exp Evaluate the following algebraic expression at the given (indicated) value

① $8x - \frac{1}{2}x^2 + 3x - 4$, $x = 2$

$8(2) - \frac{1}{2}(2)^2 + 3(2) - 4$

$16 - \frac{1}{2}(4) + 6 - 4$

$16 - 2 + 6 - 4 = 16$

② $\frac{3x - 2y}{2y + 3x}$, $x = -1$, $y = 2$

$\frac{3(-1) - 2(2)}{2(2) + 3(-1)} = \frac{-3 - 4}{4 + -3} = \frac{-7}{1} = -7$

$\frac{\quad}{2(2)+3(-1)} = \frac{\quad}{4+-5}$

Remark • Any Poly with Single term is monomial (monopoly) Polynomial

Exp $3x$, $\frac{1}{2}\cdot y^5$, $\frac{3}{2}$, $-5\cdot y^2$

• Any Poly with two terms is bi nomial

Exp $3x^2 - x$, $2 - x^4$, $3y^{10} - y^7$,

• Any Poly with three terms is tri nomial

Exp $x^3 - 2x^2 + 1$, $y^5 - 5y + 10$, ...

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like terms

الحدود المتشابهة
والتي يمكن جمعها (طرحها)

Exp • like terms

$8xy$, $-5xy$

$\ldots - 5xy = xy[8-5]$

$8xy + -5xy = xy[8-5]$

$= 3xy$

- 12 , -4 like terms

$12 + -4 = 8$

- $5x^3y$, $5y^3x$ not like terms

Exp Simplify (or combin like terms) (remove parentheses)

(1) $(2x^3 - 4xy) + (5xy - 8x^3)$

$2x^3 - 8x^3 - 4xy + 5xy$

$-6x^3 + xy$

$x^3[2-8] + xy[-4+5]$

$x^3(-6) + xy(1)$

$-6x^3 + xy$

(2) $-[6 - 3(y-1) + 3y]$

$$-[6 - 3y + 3 + 3y]$$

$$-[9] = -9$$

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

$$3x^2 + 4xy + 5y^2 + 1 - 6x^2 + 2xy - 4$$

$$3x^2 - 6x^2 + 4xy + 2xy + 1 - 4 + 5y^2$$

$$-3x^2 + 6xy - 3 + 5y^2$$