MPM1D: Principles of Mathematics

Adding and Subtracting Polynomials

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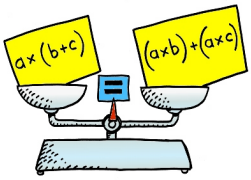

Collecting Like Terms

Recap

Simplify the polynomial expression $3x^2 + x + 9 + 5x - 7$.

The terms x and $5x$ and like, as are the constants 9 and -7.

$$\begin{aligned} 3x^2 + x + 9 + 5x - 7 &= 3x^2 + x + 5x + 9 - 7 \\ &= 3x^2 + (1+5)x + (9-7) \\ &= 3x^2 + 6x + 2 \end{aligned}$$

Adding and Subtracting Polynomials

Just as constants or powers can be added or subtracted, entire polynomials can be too.

Consider the polynomial expressions $4x - 5$ and $6x + 8$.

Adding them results in a new polynomial expression, which can be simplified by collecting like terms.

$$\begin{aligned} (4x - 5) + (6x + 8) &= 4x + 6x - 5 + 8 \\ &= (4+6)x + (-5+8) \\ &= 10x + 3 \end{aligned}$$

In this case, the new expression is a binomial like the original expressions, but this is not always true.

Adding and Subtracting Polynomials

Similarly, the two terms can be subtracted.

When subtracting one polynomial from another, it is important to remember that each term is being subtracted. This has the result of changing each term's sign.

$$\begin{aligned} (4x - 5) - (6x + 8) &= 4x - 5 \color{red}{-6x - 8} \\ &= 4x - 6x - 5 - 8 \\ &= (4-6)x - (5+8) \\ &= -2x - 13 \end{aligned}$$

Adding and Subtracting Polynomials

Example

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

Since we are adding, each sign in the second polynomial expression stays the same.

$$\begin{aligned} (4x^2 + 5x - 1) + (2x^2 + 6x + 3) &= 4x^2 + 5x - 1 + 2x^2 + 6x + 3 \\ &= 4x^2 + 2x^2 + 5x + 6x - 1 + 3 \\ &= (4+2)x^2 + (5+6)x + (-1+3) \\ &= 6x^2 + 11x + 2 \end{aligned}$$

The result is a trinomial, like the original polynomial expressions.

Adding and Subtracting Polynomials

Example

Simplify $(5x^2 + 7) - (3x - 8)$.

Since we are subtracting, each sign in the second polynomial expression changes.

$$\begin{aligned} (5x^2 + 7) - (3x - 8) &= 5x^2 + 7 \color{red}{-3x + 8} \\ &= 5x^2 - 3x + 7 + 8 \\ &= 5x^2 - 3x + 15 \end{aligned}$$

The result is a trinomial, whereas the original polynomial expressions were both binomials.

Adding and Subtracting Polynomials

Example

Simplify $(4x + 5) - (3x^2 - 2x) + (2x^2 - 7)$.

We can add or subtract any number of polynomial expressions, using the same rules as earlier.

$$\begin{aligned}(4x + 5) - (3x^2 - 2x) + (2x^2 - 7) &= 4x + 5 - 3x^2 + 2x + 2x^2 - 7 \\ &= -3x^2 + 2x^2 + 4x + 2x + 5 - 7 \\ &= (-3 + 2)x^2 + (4 + 2)x + 5 - 7 \\ &= -x^2 + 6x - 2\end{aligned}$$

Questions?