Synthetic Division

Synthetic division is a quick and easy method for division of polynomials when the divisor is a binomial of the form (x - n).

Example 1

Divide $2x^2 + 5x - 8$ by x + 3.

Long Division Solution

To perform division of $2x^2 + 5x - 8$ by x+3, $x \neq -3$, create a frame as below.

Place the value of n from the divisor outside the frame and the coefficients of the dividend inside the frame, along the top. Leave a blank line below the numbers.

x+3 $2x^2 + 5x - 8$ → Long Division \uparrow n=-3

Divide $2x^{\scriptscriptstyle 2} + 5x - 8\;\; \text{by}\; x + 3$.

Synthetic Division Solution



Example 2

Divide $2x^4 - 3x^3 - 12x^2 + 8$ by x - 4 using synthetic division.

The Division Statement: $2x^4 - 3x^3 - 12x^2 + 8 = (x-4)(2x^3 + 5x^2 + 8x + 32) + 136$

Example 3

Divide $4x^3 - 11x - 9$ by 2x - 3 using synthetic division.

The Division Statement: $4x^3 - 11x - 9 = (2x-3)(2x^2 + 3x - 1) - 12$

This example demonstrates the challenge faced when working with a linear divisor of the form $\ mx-n$, where $m{\ne}1$.

There may be less opportunity for an error to be made or for a step to be missed if long division is used in these situations.

A more complicated version of synthetic division can be performed when the divisor is non-linear.

Again, it is likely much easier to just use long division