## 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 $2 x^{2}+5 x-8$ by $x+3$.

## Long Division Solution

To perform division of $2 x^{2}+5 x-8$ 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\longdiv{2x+2}+5x-8}\quad->\mathrm{ Long Division
    \uparrow
n=-3
```

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

## Synthetic Division Solution



## Example 2

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

The Division Statement: $\quad 2 x^{4}-3 x^{3}-12 x^{2}+8=(x-4)\left(2 x^{3}+5 x^{2}+8 x+32\right)+136$

## Example 3

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

## The Division Statement: $\quad 4 x^{3}-11 x-9=(2 x-3)\left(2 x^{2}+3 x-1\right)-12$

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

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

