Synthetic Division

A modified/streamlined process of long division (synthetic division) can be used when the divisor has the form \( x - \alpha \).

**Ex 1** Use synthetic division to divide.

a) \((x^3 - 4x^2 + 5x - 6) \div (x - 3)\)  
b) \((2x^3 - 3x^2 + 8) \div (x + 2)\)

c) \((8x^3 - 1 + 7x - 6x^2) \div \left(x - \frac{1}{2}\right)\)

**The Remainder Theorem**

The remainder obtained upon dividing a polynomial \( P(x) \) by \( x - r \) is \( P(r) \).

What does the Remainder Theorem tell us about the above examples?

Ex1a)  
Ex1b)  
Ex1c)

**Ex 2** Use synthetic division to find \( f(-2) \) where \( f(x) = 3x^4 + 8x^3 + 2x^2 - 7x - 4 \).