NUMERICAL PROPERTIES OF POLYNOMIAL FUNCTIONS

What is the connection between finite differences and a polynomial function?

- Do 1.5.3 #1 - 5 (Question 4 should be $\mathbf{y = x^4}$)

A polynomial of degree n has constant nth differences

For example, $y=x^2-3 \rightarrow$

* Make sure you have enough data (more needed as degree increases)

x	y	1st	2nd	3rd
−2	−2			
		4		
−1	2		−6	
		−2		6
0	0		0	
		−2		6
1	−2		6	
		4		
2	2			

The differences have the same sign as the leading coefficient

nth differences are the equal to **a x n!**

a is the leading coefficient. n is the degree of the polynomial

n! - means n factorial..... eg. 5! = 5 x 4 x 3 x 2 x 1

Example

Find the constant differences of $y=-6x^3+x$

$$3^{rd}\text{ diff} = \underset{\text{Leading coeff.}}{-6} \times \underset{\text{degree}}{3}! = -6 \times (3 \times 2 \times 1) = \underline{\underline{-36}}$$

Example

A polynomial has degree 5 and 5th difference of 1200. Find the leading coefficient.

$$1200 = a \times 5!$$
$$= a \times 120$$
$$a = \frac{1200}{120}$$
$$a = 10$$