BINOMIAL EXPANSION

binomial expansion

A binomial expansion is an expansion of a bracket containing two terms, which is raised to a power, e.g. $(1+2x)^{10}$

The general formula for a binomial expansion is:

$$(a+b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^r \quad (n \in \mathbb{N})$$

where $\binom{n}{r} = {}^nC_r = \dfrac{n!}{r!(n-r)!}$

fraction or negative

if n is a fraction or negative: the corresponding equation is

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \dots + \left(\frac{n(n-1)\dots(n-r+1)}{r!}\right)x^r \dots$$

expansion is valid when $|x| < 1$

* sub values into equation.

Expanding $(a+bx)^n$ fraction or negative

* take a factor of $(a)^n$ out $\Rightarrow$ must be $(1+\frac{b}{a}x)^n$ to expand.
* multiply by $(a)^n$ at the end.

the expansion $(a+bx)^n$ is valid for $\left|\frac{b}{a}x\right| < 1 \therefore |x| < \left|\frac{a}{b}\right|$

Binomial estimation

it is often useful to find simple approximations for complicated functions. if the value of x is less than one, then x^n gets smaller as n gets larger.
if x is small you can sometimes ignore large powers of x to approximate a function or estimate a value.