

Newtons's binomial theorem

The expansion of the binomial power $(a+b)^n$ is:

$$(a + b)^n = \sum_{k=0}^n \binom{n}{k} a^{n-k} b^k$$

$$(a + b)^n = \binom{n}{0} a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \dots + \binom{n}{n-2} a^2 b^{n-2} + \binom{n}{n-1} a b^{n-1} + \binom{n}{n} b^n$$

Whenever n is positive integer number.

The binomial coefficients are:

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

Where $n!$ denotes factorial of n

$n! = n \cdot (n-1) \cdot (n-2) \cdot (n-3) \cdot \dots \cdot 4 \cdot 3 \cdot 2 \cdot 1$. Example: $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

Examples:

$$(a + b)^2 = a^2 + 2 a b + b^2$$

$$(a - b)^2 = a^2 - 2 a b + b^2$$

$$(a + b)^3 = a^3 + 3 a^2 b + 3 a b^2 + b^3$$

$$(a - b)^3 = a^3 - 3 a^2 b + 3 a b^2 - b^3$$

$$(a + b)^4 = a^4 + 4a^3 b + 6a^2 b^2 + 4a b^3 + b^4$$

$$(a - b)^4 = a^4 - 4a^3 b + 6a^2 b^2 - 4a b^3 + b^4$$

$$(a + b)^5 = a^5 + 5a^4 b + 10a^3 b^2 + 10a^2 b^3 + 5a b^4 + b^5$$

$$(a - b)^5 = a^5 - 5a^4 b + 10a^3 b^2 - 10a^2 b^3 + 5a b^4 - b^5$$

