Binomial Theorem

(i) If n is a +ve integers, then for all values of a and x,

$(a + x)^n = {}^nC_0\, a^n + {}^nC_1 a^{n-1} x + {}^nC_2\, a^{n-2} x^2 + {}^nC_3\, a^{n-3} x^3 + \ldots\ldots\ldots\ldots + {}^nC_n\, x^n$

(ii) If n is –ve integer or fraction, then

$(1 + x)^n = 1 + nx + \frac{n(n-1)}{2!} x^2 + \frac{n(n-1)(n-2)}{3!} x^3 + \ldots\ldots\ldots$, provided $|x| < 1$

(iii) $(1 + x)^{-1} = 1 - x + x^2 - x^3 + x^4 - \ldots\ldots\ldots\infty$

(iv) $(1 - x)^{-1} = 1 + x + x^2 + x^3 + x^4 + \ldots\ldots\ldots\infty$

(v) $(1 + x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + \ldots\ldots\ldots\ldots\infty$

(vi) $(1 - x)^{-2} = 1 + 2x + 3x^2 + 4x^3 + \ldots\ldots\ldots\ldots\infty$