EXTENDING THE BINOMIAL THEOREM | KEY POINTS

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{1.2}x^2 + \ldots + \frac{n(n-1)\ldots(n-r+1)}{1.2\ldots r}x^r + \ldots \quad (|x| < 1, n \in \mathbb{Q})$$

- The ***first term*** in the ***bracket*** must be a '1'.
- The ***power*** can be any ***rational number*** (unlike the previous version of the formula you encountered).
- The expansion is only ***valid*** for values of x such that $-1 < x < 1$.
- The ***more terms*** you calculated, the ***more accurate*** the expansion is.

BINOMIAL EXPANSIONS | EXAMPLE-PROBLEM PAIRS

(a) Find the first four terms in the binomial expansion of $\frac{3}{(1-4x)^2}$.

(b) State the region for which the expansion is valid.

(a) Find the first four terms in the binomial expansion of $\frac{5}{\sqrt{1-2x}}$.

(b) State the region for which the expansion is valid.

BINOMIAL EXPANSIONS | EXAMPLE-PROBLEM PAIR 2

(a) Find the three terms in the binomial expansion of $\sqrt{x+4}$

(b) Find the values of x for which this expansion is valid.

(a) Find the three terms in the binomial expansion of $\sqrt[3]{8+x}$

(b) State the region for which the expansion is valid.

BINOMIAL EXPANSIONS | EXAMPLE-PROBLEM PAIR 3

(a) Find the first two terms in the binomial expansion of $(9+4x)^{\frac{1}{2}}$

(b) Use this polynomial to approximate $\sqrt{9.4}$ to three decimal places.

(a) Find the first three terms in the binomial expansion of $(1+3x)^{\frac{1}{4}}$

(b) Use this expansion to find an approximate value of $\sqrt[4]{1.9}$, correct to 4 decimal places.

BINOMIAL EXPANSIONS | EXAMPLE-PROBLEM PAIR 4

Find the quadratic term in the binomial expansion of $\sqrt{\frac{1+x}{1-x}}$ if $|x|<1$.

Expand $\frac{1+2x}{(2-x)^2}$ up to the term in x^3. *(Hint: You do not need to do a binomial expansion for the numerator.)*