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Binomial Series

(Haf 2005)

2. Expand $(1-2x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which the expansion is valid.

Hence, by writing $x=\frac{1}{8}$ in your expansion, find an approximate value for $\sqrt{3}$ in the form $\frac{a}{b}$, where a and b are integers. [5]

(Haf 2006)

10. Expand $\left(1+\frac{x}{8}\right)^{\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2. State the range of x for which the expansion is valid. Hence by writing $x = 1$ in your expansion, show that $\sqrt{2} \approx \frac{256}{181}$. [5]

(Haf 2007)

4. Expand $(1+4x)^{\frac{1}{2}} - \frac{1}{1+3x}$ as far as the term in x^2. For what range of values of x is your expansion valid? [7]

(Haf 2008)

9. Expand $\frac{1+3x}{\sqrt{1-2x}}$ in ascending powers of x up to and including the term in x^2. State the range of x for which the expansion is valid. [5]

(Haf 2009)

9. Expand $(1+4x)^{\frac{1}{2}}$ in ascending powers of x as far as the term in x^2. State the range of values of x for which your expansion is valid.

Expand $(1+4k+16k^2)^{\frac{1}{2}}$ in ascending powers of k as far as the term in k^2. [6]

(Haf 2010)

5. Expand $\left(1-\frac{x}{4}\right)^{\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid.

Hence, by writing $x = 1$ in your expansion, show that

$$\sqrt{3} \approx \frac{111}{64} .$$ [5]

(Haf 2011)

6. Expand $4(1+2x)^{\frac{1}{2}} - \frac{1}{(1+3x)^2}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid. [7]

(Haf 2012)

5. Expand $\left(1+\frac{x}{3}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid.

Hence, by writing $x = \frac{1}{5}$ in your expansion, find an approximate value for $\sqrt{15}$ in the form $\frac{a}{b}$, where a and b are integers whose values are to be found. [5]

(Haf 2013)

5. *(a)* (i) Expand $(1 + 6x)^{\frac{1}{3}}$ in ascending powers of x up to and including the term in x^2.

(ii) State the range of values of x for which your expansion is valid. [3]

(b) Use your expansion in part *(a)* to find an approximate value for one root of the equation

$$2(1 + 6x)^{\frac{1}{3}} = 2x^2 - 15x.$$ [2]

(Haf 2014)

5. Expand

$$6\sqrt{1-2x} - \frac{1}{1+4x}$$

in ascending powers of x up to and including the term in x^2.
State the range of values of x for which your expansion is valid. [7]

(Haf 2015)

5. Expand $\left(1+\frac{x}{8}\right)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2.

State the range of values of x for which your expansion is valid.
Hence, by writing $x = 1$ in your expansion, find an approximate value for $\sqrt{2}$ in the form $\frac{a}{b}$, where a and b are integers whose values are to be found. [5]

(Haf 2016)

2. *(a)* (i) Expand $\dfrac{1}{\sqrt{1+2x}}$ in ascending powers of x up to and including the term in x^2.

(ii) State the range of values of x for which your expansion is valid. [3]

(b) Use your expansion in part *(a)* to find an approximate value for one root of the equation

$$\frac{6}{\sqrt{1+2x}} = 4 + 15x - x^2.$$ [2]

(Haf 2017)

5. *(a)* Expand $(1+4x)^{-\frac{1}{2}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which your expansion is valid. [3]

(b) Use your answer to part *(a)* to expand $(1+4y+8y^2)^{-\frac{1}{2}}$ in ascending powers of y up to and including the term in y^2. [3]

(Haf 2018)

4. *(a)* Expand $\dfrac{1}{(1+2x)^2}$ in ascending powers of x up to and including the term in x^2. [2]

(b) (i) **Use your answer to part *(a)*** to expand $\left(\dfrac{1+3x}{1+2x}\right)^2$ in ascending powers of x up to and including the term in x^2.

(ii) State the range of values of x for which your expansion is valid. [4]