

C4 SERIES

Worksheet A

- 1 Find the binomial expansion of each of the following in ascending powers of x up to and including the term in x^3 , for $|x| < 1$.
- a** $(1+x)^{-1}$ **b** $(1+x)^{\frac{1}{2}}$ **c** $2(1+x)^{-3}$ **d** $(1+x)^{\frac{2}{3}}$
e $\sqrt[3]{1-x}$ **f** $\frac{1}{(1+x)^2}$ **g** $\frac{1}{4(1-x)^4}$ **h** $\frac{3}{\sqrt{1-x}}$
- 2 Expand each of the following in ascending powers of x up to and including the term in x^3 and state the set of values of x for which each expansion is valid.
- a** $(1+2x)^{\frac{1}{2}}$ **b** $(1-3x)^{-1}$ **c** $(1-4x)^{-\frac{1}{2}}$ **d** $(1+\frac{1}{2}x)^{-3}$
e $(1-6x)^{\frac{1}{3}}$ **f** $(1+\frac{1}{4}x)^{-4}$ **g** $(1+2x)^{\frac{3}{2}}$ **h** $(1-3x)^{-\frac{4}{3}}$
- 3 **a** Expand $(1-2x)^{\frac{1}{2}}$, $|x| < \frac{1}{2}$, in ascending powers of x up to and including the term in x^3 .
b By substituting a suitable value of x in your expansion, find an estimate for $\sqrt{0.98}$
c Show that $\sqrt{0.98} = \frac{7}{10}\sqrt{2}$ and hence find the value of $\sqrt{2}$ correct to 8 significant figures.
- 4 Expand each of the following in ascending powers of x up to and including the term in x^3 and state the set of values of x for which each expansion is valid.
- a** $(2+x)^{-1}$ **b** $(4+x)^{\frac{1}{2}}$ **c** $(3-x)^{-3}$ **d** $(9+3x)^{\frac{1}{2}}$
e $(8-24x)^{\frac{1}{3}}$ **f** $(4-3x)^{-1}$ **g** $(4+6x)^{-\frac{1}{2}}$ **h** $(3+2x)^{-2}$
- 5 **a** Expand $(1+2x)^{-1}$, $|x| < \frac{1}{2}$, in ascending powers of x up to and including the term in x^3 .
b Hence find the series expansion of $\frac{1-x}{1+2x}$, $|x| < \frac{1}{2}$, in ascending powers of x up to and including the term in x^3 .
- 6 Find the first four terms in the series expansion in ascending powers of x of each of the following and state the set of values of x for which each expansion is valid.
- a** $\frac{1+3x}{1-x}$ **b** $\frac{2x-1}{(1+4x)^2}$ **c** $\frac{3+x}{2-x}$ **d** $\frac{1-x}{\sqrt{1+2x}}$
- 7 **a** Express $\frac{x-2}{(1-x)(1-2x)}$ in partial fractions.
b Hence find the series expansion of $\frac{x-2}{(1-x)(1-2x)}$ in ascending powers of x up to and including the term in x^3 and state the set of values of x for which the expansion is valid.
- 8 By first expressing $f(x)$ in partial fractions, find the series expansion of $f(x)$ in ascending powers of x up to and including the term in x^3 and state the set of values of x for which it is valid.
- a** $f(x) \equiv \frac{4}{(1+x)(1-3x)}$ **b** $f(x) \equiv \frac{1-6x}{1+3x-4x^2}$ **c** $f(x) \equiv \frac{5}{2-3x-2x^2}$
d $f(x) \equiv \frac{7x-3}{x^2-4x+3}$ **e** $f(x) \equiv \frac{3+5x}{(1+3x)(1+x)^2}$ **f** $f(x) \equiv \frac{2x^2+4}{2x^2+x-1}$