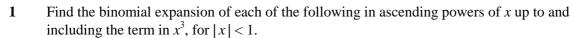
SERIES



a
$$(1+x)^{-1}$$

b
$$(1+x)^{\frac{1}{2}}$$

c
$$2(1+x)^{-3}$$

d
$$(1+x)^{\frac{2}{3}}$$

$$e \quad \sqrt[3]{1-x}$$

$$\mathbf{f} = \frac{1}{(1+x)^2}$$

b
$$(1+x)^{\frac{1}{2}}$$
 c $2(1+x)^{-3}$ **d** $(1+x)^{\frac{2}{3}}$
f $\frac{1}{(1+x)^2}$ **g** $\frac{1}{4(1-x)^4}$ **h** $\frac{3}{\sqrt{1-x}}$

$$\mathbf{h} \quad \frac{3}{\sqrt{1-x}}$$

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
$$(1-3x)^{-1}$$

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** $(1-3x)^{-\frac{4}{3}}$

d
$$(1 + \frac{1}{2}x)^{-3}$$

e
$$(1-6x)^{\frac{1}{3}}$$

f
$$(1 + \frac{1}{4}x)^{-4}$$

$$\mathbf{g} (1 + 2x)^{\frac{3}{2}}$$

h
$$(1-3x)^{-1}$$

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 . 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.

Expand each of the following in ascending powers of x up to and including the term in x^3 and 4 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
$$(8-24x)^{\frac{1}{2}}$$

$$\mathbf{f} (4-3x)^{-1}$$

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** $(3+2x)^{-2}$

h
$$(3+2x)^{-2}$$

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

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 .

Find the first four terms in the series expansion in ascending powers of x of each of the following 6 and state the set of values of x for which each expansion is valid.

$$\mathbf{a} \quad \frac{1+3x}{1-x}$$

b
$$\frac{2x-1}{(1+4x)^2}$$
 c $\frac{3+x}{2-x}$ **d** $\frac{1-x}{\sqrt{1+2x}}$

$$\mathbf{c} \quad \frac{3+x}{2-x}$$

$$\mathbf{d} \quad \frac{1-x}{\sqrt{1+2x}}$$

a Express $\frac{x-2}{(1-x)(1-2x)}$ in partial fractions. 7

> **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
$$f(x) = \frac{4}{(1+x)(1-3x)}$$
 b $f(x) = \frac{1-6x}{1+3x-4x^2}$ **c** $f(x) = \frac{5}{2-3x-2x^2}$

b
$$f(x) \equiv \frac{1 - 6x}{1 + 3x - 4x^2}$$

$$\mathbf{c} \quad \mathbf{f}(x) \equiv \frac{5}{2 - 3x - 2x^2}$$

d
$$f(x) \equiv \frac{7x-3}{x^2-4x+3}$$

d
$$f(x) \equiv \frac{7x-3}{x^2-4x+3}$$
 e $f(x) \equiv \frac{3+5x}{(1+3x)(1+x)^2}$ **f** $f(x) \equiv \frac{2x^2+4}{2x^2+x-1}$

$$\mathbf{f} \quad f(x) = \frac{2x^2 + 4}{2x^2 + x - 1}$$