C4 Jan 2006

YORKSHIRE MATHS TUTOR

5.

$$f(x) = \frac{3x^2+16}{(1-3x)(2+x)^2} = \frac{A}{(1-3x)} + \frac{B}{(2+x)} + \frac{C}{(2+x)^2}, \qquad |x| < \tfrac{1}{3}.$$

(a) Find the values of $A$ and $C$ and show that $B = 0$.

**(4)**

(b) Hence, or otherwise, find the series expansion of f($x$), in ascending powers of $x$, up to and including the term in $x^3$. Simplify each term.

**(7)**

C4 Jan 2007

Leave blank

**1.** $$f(x) = (2 - 5x)^{-2}, \qquad |x| < \tfrac{2}{5}.$$

Find the binomial expansion of f($x$), in ascending powers of $x$, as far as the term in $x^3$, giving each coefficient as a simplified fraction.

**(5)**



N 2 3 5 6 2 A 0 2 2 0

Jan 08

Leave blank

2. (a) Use the binomial theorem to expand

$$(8-3x)^{\frac{1}{3}}, \qquad |x| < \tfrac{8}{3},$$

in ascending powers of $x$, up to and including the term in $x^3$, giving each term as a simplified fraction.

**(5)**

(b) Use your expansion, with a suitable value of $x$, to obtain an approximation to $\sqrt[3]{(7.7)}$. Give your answer to 7 decimal places.

**(2)**



N 2 6 2 8 2 A 0 4 2 4

Jan 2009

**3.**

$$f(x) = \frac{27x^2 + 32x + 16}{(3x+2)^2(1-x)}, \quad |x| < \frac{2}{3}.$$

Given that f($x$) can be expressed in the form

$$f(x) = \frac{A}{(3x+2)} + \frac{B}{(3x+2)^2} + \frac{C}{(1-x)},$$

(*a*) find the values of $B$ and $C$ and show that $A = 0$.

**(4)**

(*b*) Hence, or otherwise, find the series expansion of f($x$), in ascending powers of $x$, up to and including the term in $x^2$. Simplify each term.

**(6)**

(*c*) Find the percentage error made in using the series expansion in part (*b*) to estimate the value of f(0.2). Give your answer to 2 significant figures.

**(4)**

Jan
2010

1. (*a*) Find the binomial expansion of

$$\sqrt{(1-8x)}, \quad |x| < \frac{1}{8},$$

in ascending powers of $x$ up to and including the term in $x^3$, simplifying each term.

**(6)**

(*b*) Show that, when $x = \frac{1}{100}$, the exact value of $\sqrt{(1-8x)}$ is $\frac{\sqrt{23}}{5}$.

**(2)**

(*c*) Substitute $x = \frac{1}{100}$ into the binomial expansion in part (*a*) and hence obtain an approximation to $\sqrt{23}$. Give your answer to 5 decimal places.

**(3)**

**5.** (*a*) Use the binomial theorem to expand

Jan 2011

$$(2-3x)^{-2}, \quad |x| < \frac{2}{3},$$

in ascending powers of $x$, up to and including the term in $x^3$. Give each coefficient as a simplified fraction.

**(5)**

$$f(x) = \frac{a+bx}{(2-3x)^2}, \quad |x| < \frac{2}{3}, \quad \text{where } a \text{ and } b \text{ are constants.}$$

In the binomial expansion of f($x$), in ascending powers of $x$, the coefficient of $x$ is 0 and the coefficient of $x^2$ is $\frac{9}{16}$.

Find

(*b*) the value of $a$ and the value of $b$,

**(5)**

(*c*) the coefficient of $x^3$, giving your answer as a simplified fraction.

**(3)**

C4 Jan 2012

Leave blank

**3.** (a) Expand

$$\frac{1}{(2-5x)^2}, \quad |x| < \frac{2}{5}$$

in ascending powers of $x$, up to and including the term in $x^2$, giving each term as a simplified fraction.

**(5)**

Given that the binomial expansion of $\dfrac{2+kx}{(2-5x)^2}$, $|x| < \dfrac{2}{5}$, is

$$\frac{1}{2} + \frac{7}{4}x + Ax^2 + \ldots$$

(b) find the value of the constant $k$,

**(2)**

(c) find the value of the constant $A$.

**(2)**

C4 June 2005

Leave blank

**1.** Use the binomial theorem to expand

$$\sqrt{(4-9x)}, \qquad |x| < \frac{4}{9},$$

in ascending powers of $x$, up to and including the term in $x^3$, simplifying each term.

**(5)**

Q1

**(Total 5 marks)**



N 2 0 2 3 2 B 0 2 2 4

C4 June 2006

Leave blank

**2.** $$f(x) = \frac{3x-1}{(1-2x)^2}, \qquad |x| < \tfrac{1}{2}.$$

Given that, for $x \neq \frac{1}{2}$, $\dfrac{3x-1}{(1-2x)^2} = \dfrac{A}{(1-2x)} + \dfrac{B}{(1-2x)^2}$, where $A$ and $B$ are constants,

(a) find the values of $A$ and $B$.

**(3)**

(b) Hence, or otherwise, find the series expansion of $f(x)$, in ascending powers of $x$, up to and including the term in $x^3$, simplifying each term.

**(6)**

C4 June 2007

Leave blank

**1.** $$f(x) = (3 + 2x)^{-3}, \quad |x| < \tfrac{3}{2}.$$

Find the binomial expansion of f($x$), in ascending powers of $x$, as far as the term in $x^3$.

Give each coefficient as a simplified fraction.

**(5)**

Jun 08

Leave blank

**5.** (a) Expand $\dfrac{1}{\sqrt{(4-3x)}}$, where $|x| < \frac{4}{3}$, in ascending powers of $x$ up to and including the term in $x^2$. Simplify each term. **(5)**

(b) Hence, or otherwise, find the first 3 terms in the expansion of $\dfrac{x+8}{\sqrt{(4-3x)}}$ as a series in ascending powers of $x$. **(4)**

June
2009

**1.**

$$f(x) = \frac{1}{\sqrt{(4+x)}}, \quad |x| < 4.$$

Find the binomial expansion of f $(x)$ in ascending powers of $x$, up to and including the term in $x^3$. Give each coefficient as a simplified fraction.

**(6)**

**5.** $$\frac{2x^2+5x-10}{(x-1)(x+2)} \equiv A + \frac{B}{x-1} + \frac{C}{x+2}.$$

June 2010

(*a*) Find the values of the constants $A$, $B$ and $C$.

**(4)**

(*b*) Hence, or otherwise, expand $\dfrac{2x^2+5x-10}{(x-1)(x+2)}$ in ascending powers of $x$, as far as the term in $x^2$.

Give each coefficient as a simplified fraction.

**(7)**

C4 June 2011

Leave blank

**2.**

$$f(x) = \frac{1}{\sqrt{(9+4x^2)}}, \quad |x| < \frac{3}{2}$$

Find the first three non-zero terms of the binomial expansion of $f(x)$ in ascending powers of $x$. Give each coefficient as a simplified fraction.

**(6)**

C4 June 2012

Leave blank

3. $$f(x) = \frac{6}{\sqrt{(9-4x)}}, \quad |x| < \frac{9}{4}$$

(a) Find the binomial expansion of $f(x)$ in ascending powers of $x$, up to and including the term in $x^3$. Give each coefficient in its simplest form.

**(6)**

Use your answer to part (a) to find the binomial expansion in ascending powers of $x$, up to and including the term in $x^3$, of

(b) $g(x) = \dfrac{6}{\sqrt{(9+4x)}}, \quad |x| < \dfrac{9}{4}$

**(1)**

(c) $h(x) = \dfrac{6}{\sqrt{(9-8x)}}, \quad |x| < \dfrac{9}{8}$

**(2)**

C4 Jan 2013

Leave blank

**1.** Given

$$f(x) = (2 + 3x)^{-3}, \qquad |x| < \frac{2}{3}$$

find the binomial expansion of f($x$), in ascending powers of $x$, up to and including the term in $x^3$.

Give each coefficient as a simplified fraction.

**(5)**

C4 June 2013

Leave blank

**2.** (a) Use the binomial expansion to show that

$$\sqrt{\left(\frac{1+x}{1-x}\right)} \approx 1 + x + \frac{1}{2}x^2, \quad |x| < 1$$

**(6)**

(b) Substitute $x = \frac{1}{26}$ into

$$\sqrt{\left(\frac{1+x}{1-x}\right)} = 1 + x + \frac{1}{2}x^2$$

to obtain an approximation to $\sqrt{3}$

Give your answer in the form $\frac{a}{b}$ where $a$ and $b$ are integers.

**(3)**